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CHICAGO, AUGUST, 1914.

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THIS IS THE TIME

ONE of our advertisers in this issue has called attention to the fact that not since the panic of 1907 have prices of construction material been so low as they are now. Copper and steel are down, factories are running on part time, and orders are hard to get.

It is just such occasional periods, brought about by certain combinations of circumstances that we cannot always understand, that the fore-handed man learns to take advantage of. The successful Wall street operator buys when everyone else has forced the market down by selling. The enterprising purchaser buys when everyone else has forced his market down by refusing to buy. Mills and factories must sell their product, must meet their overhead charges whether they make any profit or not. When nobody wants to buy, lower prices are inevitable; and then the exception, the man who is looking for opportunity, steps up and lays in his supplies, and the money he saves thereby is just as real as though he had gained it by raising his own rates.

The fore-handed man's opportunity is right now. But it cannot last very long. Already the steel business, popularly known as the industrial barometer, has awakened from its nap and is stirring. Tremendous crops are coming, and there will be plenty of cars to move them. Even the sellers of such semi-luxuries as automobiles feel the quickening impulse and are preparing to meet it.

The time to buy is now—right now. This exhortation is only for the wide-awake, all-alive business man. His opportunity will vanish when everybody starts buying, as everybody will very shortly. Soon the demand will rush back to normal, the accumulated supply will disappear, and prices will rise again, perhaps above their former mark.

The telephone business progresses all the time. There is a constant demand for growth. When the operating company does not attempt to keep pace with that demand, the work simply piles up ahead. The increase must be made sooner or later, and sooner or later the material for it must be bought. It is entirely a matter of choice; one can wait for that delusive "psychological moment" when everybody else starts buying, and, so doing, pay higher prices and wait longer for deliveries; or one can buy now and get low prices and prompt deliveries. It is hardly necessary to point out which of these methods shows the most business sense and enterprise.

The wise telephone man who ever expects to do any more construction work will *buy now!*

OHIO'S BIG COMPANY

IN a somewhat desultory way we have tried to record, on another page, a few recent steps in independent telephone progress. But without question the greatest step of all in late years, if not in the history of the divided field, is that just completed in Ohio. We say completed because every legal formality has now been complied with and all necessary approval obtained, and the Ohio State Telephone Company is a going concern from now on.

The simple announcement of President S. G. McMeen, whose very name carries assurance of genuine independence and sincere service, holds a terse optimism that promises a great deal for independent telephony:

We are pleased to announce that the following independent telephone companies in Ohio have been mergd into one company, with offices at Columbus, which is now known as "The Ohio State Telephone Company":

The United States Telephone Company,
The Cuyahoga Telephone Company,
The Columbus Citizens Telephone Company,
The Toledo Home Telephone Company,
The Dayton Home Telephone Company,
The Youngstown Telephone Company,
The Stark County Telephone Company,
The Columbiana County Telephone Company,
The Massillon Telephone Company,
The Zanesville Telephone & Telephone Company,
The Lancaster Telephone Company,
The London Home Telephone Company,
The Washington Home Telephone Company,
The Findlay Home Telephone Company,
The Citizens Telephone & Message Company.

It is the policy of the new company to improve service wherever possible, and to get and care for all the new business it can.

The management of the Ohio State Telephone Company feels that this consolidation and combination of interests is a most hopeful and promising one for the general good of independent telephony in Ohio and neighboring states, and for that reason invites every form of co-operation on your part for which occasion shall arise.

The final approval of the Public Utilities Commission of Ohio, which, of course, it was necessary to obtain, was handed down July 23. The word of the order for approval of the consolidation gives considerable information in the matter of valuation and rates of the new company:

The commission being satisfied that said consolidation and merger will promte the public convenience and will furnish the public adequate service for a reasonable rate, rental, toll and charge, and the commission having ascertained and now determines the valuation of the property of said constituent companies upon which the rates, tolls, rentals and charges are based, to be the sum of $23,500,000 and having now fixed and determined the rates now in effect by said several constituents companies and on file with this commission, as the rates, charges, tolls and rentals to be charged after such consolidation and merger.

Providing, of course, that the commission may, at any time in the future, make any appraisal and valuation or determine and fix any rates charged, upon proper motion.

Inasmuch as the method of financing the company will doubtless prove interesting to independent telephone men, we quote the commission's order of approval of the issue of stocks and bonds:

——The issue of the proposed new securities of the Ohio State Telephone Company, viz: not exceeding $5,206,000 par value of common stock, not exceeding $4,850,000 of preferred stock, and not exceeding $5,000,000 of Series B consolidated and refunding mortgage sinking fund gold bonds under the mortgage dated July 1, 1914, to Bankers Trust Company, trustee, said $5,000,000 Series B bonds bearing interest for the first two years at the rate of 3 per cent per annum, for the third year at the rate of 4 per cent per annum and thereafter at the rate of 5 per cent per annum, such stocks and bonds and the proceeds thereof to be used solely for the purposes set forth in the agreement for consolidation dated May 21, 1914, viz: $3,500,000 par value of said Series B bonds to be sold at not less than 80 and the proceeds, to the extent of $5,000,000 to be used only for refunding outstanding capital liabilities of the constituent companies, and the remaining proceeds to the extent of at least $2,350,000 to be used for additions, improvements and extensions (including at least $400,000 to be expended within the city of Cleveland for additions, improvements and extensions, and at least $100,000 to be expended within the county of Cuyahoga, outside of said city, for additions, improvements and extensions—pursuant to a requirement of the said city of Cleveland which has been accepted by the Cuyahoga Telephone Company and assumed by the Ohio State Telephone Company).

$1,500,000 par value of said Series B bonds to be exchanged, pursuant to the agreement for consolidation for stocks of the constituent companies as follows:

$15.94 par value of said bonds for each of the outstanding shares of preferred stock and of common stock of the United States Telephone Company, or a total of $668,554.11.

$100 of par value of said bonds for each of the outstanding shares of preferred stock of the Home Telephone Company (of Dayton), and $33⅓ par value of said bonds for each of the outstanding shares of common stock of the same company, or a total of $660,000.

$118.75 par value of said bonds for each of outstanding shares of preferred stock of the Stark County Telephone Company, other than those named by the United States Telephone Company, and $64.50 par value of said bonds for each of outstanding shares of common stock of the same company, other than those owned by the United States Telephone Company, or a total of $17,673.

$99.71 par value of said bonds for each of outstanding shares of preferred stock of the Youngstown Telephone Company, other than those owned by the United States Telephone Company, and $28 par value of said bonds for each of the outstanding shares of common stock of the same company, other than those owned by the United States Telephone Company, or a total of $5,184.92.

$25 par value of said bonds for each of the outstanding shares of stock of the Columbiana County Telephone Company, other than those owned by the United States Telephone Company, or a total of $125.

$73.52 par value of said bonds for each of the outstanding shares of preferred stock of the Findlay Home Telephone Company, other than those owned by the United States Telephone Company, and $12.50 par value of said bonds for each of the outstanding shares of common stock of the same company, other than those owned by the United States Telephone Company, or a total of $571.15.

$66.25 par value of said bonds for each of the outstanding shares of preferred stock of the Lancaster Telephone Company, other than those owned by the United States Telephone Company, and $12.50 par value of said bonds for each of the outstanding shares of common stock of the same company, other than those owned by the United States Telephone Company, or a total of $4,641.25.

$74.25 par value of said bonds for each of the outstanding shares of preferred stock of the Masillon Telephone Company, other than those owned by the United States Telephone Company, and $18.75 par value of said bonds for each of the outstanding shares of common stock of the same company, other than those owned by the United States Telephone Company, or a total of $2,109.37.

$50 par value of said bonds for each of the outstanding shares of preferred stock of the Citizens Telephone & Message Company (of Fostoria), other than those owned by the United States Telephone Company, and $12.68 par value of said bonds for each of the outstanding shares of common stock of the same company, other than those owned by the United States Telephone Company, or a total of $1,141.20.

Not exceeding $5,206,000 par value of said common stock and not exceeding $4,850,000 par value of said preferred stock, to be issued pursuant to said agreement for consolidation in exchange for stocks of the constituent companies, as follows:

The United States Telephone Company preferred, each share receives one share of new prefrrd, total par valu new preferred $1,095,000.

The Cuyahoga Telephone Company preferred ($50 par), each two shares receive one share of new preferred ($100 par), total par value new preferred $1,437,350.

The Columbus Citizens Telephone Company preferred,

each share received one share of new preferrd, total par value of new preferred $802,100.

The Columbus Citizens Telephone Company common, each share receives eight-tenths of one share of new common, plus one-third of one share of new preferred, total par value new preferred $1,257,500.

The Toledo Home Telephone Company stock (all of one class), each share receives one share of new preferred, total par value of new preferred $250,000.

The London Home Telephone Company preferred, each share receives one-half of one share of new preferred, total par value of new preferred $5,375.

The United States Telephone Company common, each share receives one share of new common, total par value of new common $3,000,000.

The Cuyahoga Telephone Company common ($50 par), each two shares receives one share of new common, total par value of new common $1,500,000.

The Columbus Citizens Telephone Company common, each share, as above stated, receives eight-tenths of one share of new common, plus one-third of one share of new preferred, total par value of new common $600,000.

The Washington Home Telephone Company (all of one class), each share receives one share of new common, total par value of new common $200.

The London Home Telephone Company common, each share receives one-half of one share of new common, total par value of new common $5,575.

The Ohio State Telephone Company means unquestionably a new era in the independent telephone business of Ohio. It means that the companies of the state now have the first opportunity of several years, and the best opportunity they have ever had, to develop and expand. The management of the company is aggressive and up to the minute, and its securities, approved by the state commission, will undoubtedly be popular with the buying public, especially in Ohio, where they are tax-free. The new and altogether modern Ohio State Telephone Company should prove an impregnable fortress of independent telephony.

COMMISSION INFLUENCE ON SECURITIES

NOT long ago a large London bond house wrote to a correspondent in California as follows:

Please obtain for us whenever possible California securities which have been approved by the Railroad Commission of California.

This is not the only evidence that the California Commission has added to the stability and marketability of public utility securities under its jurisdiction; and no doubt all state utility commissions of any length of experience have had a similar effect. The elimination of most of the element of chance and the guaranty of reasonable return on investment by the principles of commission regulation make for a very attractive class of investment.

While this is of importance to all utilities, it has a particularly strong influence on the independent telephone business. Of course there have been notable exceptions, but, as a rule, independent securities have never received the recognition they deserved. The greater part of the early independent financing was done locally through personal friendship and civic pride. But the Bell company's anti-independent campaign, the unfortunate and injudicious action of the independent trade press in attacking Bell securities and thereby seriously injuring all telephone securities, and the inevitable failure of a number of improperly promoted independent companies, cast a shadow over the market for such securities that has been difficult to dispel. The word market is used here, of course, as representing the security-buying public at large, which buys for investment only and usually on the advice of a banker or broker.

When the problem of reasonable return on investment as a rate-making base shall have become thoroughly understood and reduced to simple and definite terms, commission regulation will amount to, not state guarantee, but state assurance of a security's stability and safety. Then independent telephone securities will sell at a higher figure and carry a lower interest rate than they do now.

In spite of the excellence and safety of some present independent telephone investments, their securities will sell on the market only at a figure which will net the investor nearly eight per cent. This makes financing rather expensive for such companies. Commission jurisdiction over securities is the only agency that promises to relieve this condition and put such securities on an equitable basis, making them just as salable and no more extravagant than other public utility securities.

WHEN THE TELEPHONE ENTERED ENGLAND

Early in 1877 the telephone was introduced in England. It made its debut in a blaze of glory. Lord Kelvin attended the first demonstration of telephony at the Philadelphia centennial in 1876. He was enraptured with the new contrivance, and the impulsive Bell presented him with the original telephone instruments. These were brought to England and exhibited by Lord Kelvin before the British Association for the Advancement of Science. Bell himself addressed the association and received a vociferous welcome. Several days later Queen Victoria expressed a desire to talk by telephone. Accordingly a wire was put up from a Downing street office to the city house of Sir Thomas Biddulph. She congratulated Bell himself, who was present. A few weeks later a wire was put up to Windsor Castle, and a tiny telephone exchange with ten wires was started in London. An order for 100 telephones was sent to Boston, and so, under the most favorable auspices, the telephone service of Great Britain began.

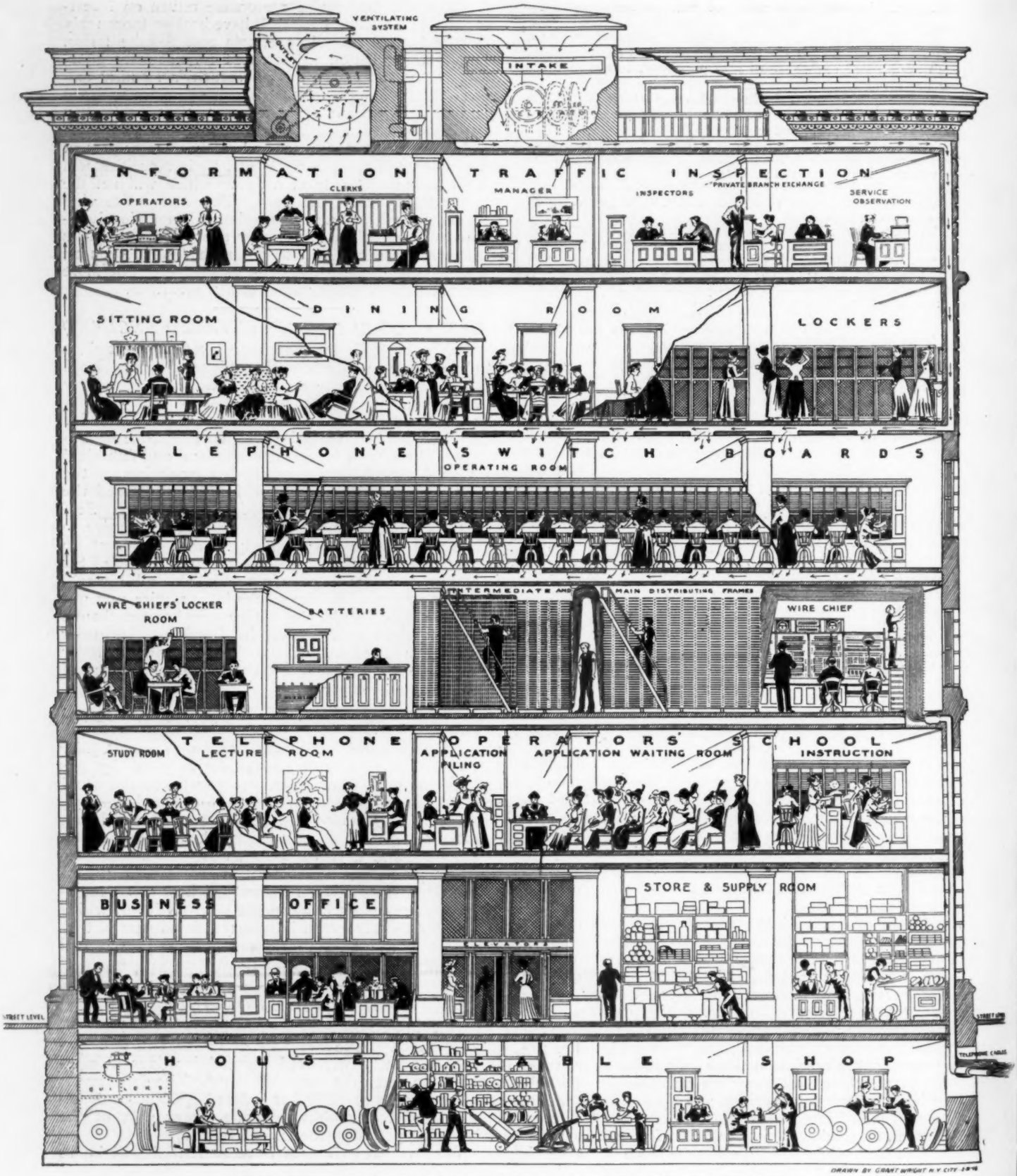
DEVICE ALLOWS DEPOSITS IN ADVANCE

A prepayment telephone station, says *Popular Mechanics*, based upon a similar device used by gas and electric-light companies, incorporates in the usual coin-slot instrument a provision for the deposit in advance of any convenient coin or coins, which are credited for service to be rendered later; the "nickel-first" telephone may be used as an "unlimited service" telephone until the credit is exhausted. An indicator is provided which shows just how much unexpended money is on hand in the box. A lever, which is pulled after each coin is inserted, is so geared that it registers the appropriate amount, and each call thereafter is deducted automatically.

TELEPHONE EXTENSION IN PANAMA

Telephone and telegraph facilities are being rapidly extended in the Republic of Panama in anticipation of a greatly increased demand for lines of communication when the canal is opened. The department of public works recently has ordered 1,800 miles of telephone and telegraph wires, the larger part of the order being placed in the United States.

The first new line to be constructed will be to David, the most important town in the republic outside of Panama City and Colon. The whole expenditure will amount to some $500,000.



Typical Cross Section of an Ideal Telephone Exchange. By the New York Telephone Company.

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.

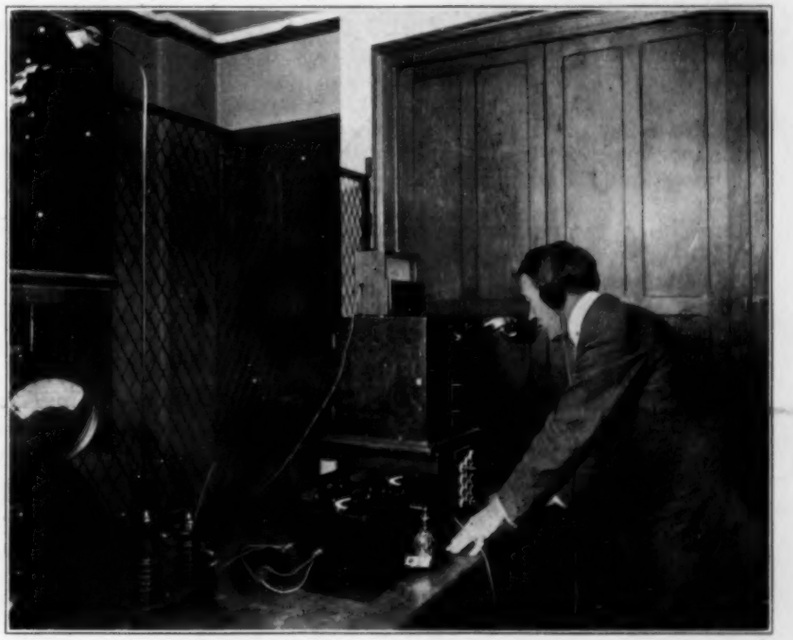
A Cross Section View of a Giant Fir Fifteen Feet in Diameter. Photos by American Cross Arm Company.

Hauling the Massive Firs from the Depths of the Virgin Forests to be Made Into Cross Arms.

Interesting Photograph of a Bolt of Lightning Leaping from One Cloud to Another in a Continuous Chain.

A Huge Fir Tree, Centuries Old.

The Pulp of a Giant Fir is Hard and of Fine Grain.



Wireless Telephone Equipment at the Scranton Station of the Lackawanna Railroad.

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD

Minimum Wage May Influence Rates

That a peculiar situation exists with reference to the telephone and telegraph industry of Washington is a point emphasized by the establishment by the minimum wage commission of nine dollars a week as a minimum to be paid the women and girls employed in the various offices of that industry in the state. On the one hand there stands the public service commission with jurisdiction to establish the rates that the telephone and telegraph companies may charge for the services rendered. On the other hand stands the minimum wage commission empowered by law to say what wages shall be paid.

The public service commission has power to establish rates upon the basis of the specific conditions existing with regard to any given company, but the industrial welfare commission, which fixes the minimum wage, must establish a wage covering the entire industry of the state, without regard to the peculiar conditions that might obain in any particular plant or with any particular company.

From this it appears likely that, following the going into effect of the nine dollars minimum wage rate ordered, the number of complaints filed with the public service commission by telephone companies, especially the small ones, will show an increase; the minimum wage becoming another condition on the basis of which the public service commission would be required to adjust the rates of any given company so that that company would enjoy a reasonable return upon its investment.

This is the only case wherein such condition as this has arisen with regard to wages and rates, as no other of the industries to be regulated by the wage commission is under the jurisdiction of the public service commission.

Rochester Company Issues Bonds

The Rochester Telephone Company has made formal application to the New York Public Service Commission for authority to issue not to exceed $100,000 par value of its general mortgage bonds.

George R. Fuller, president of the company, stated that this is a new issue but that it will be under the same mortgage as the old bonds of the company. The company has $3,000,000 authorized bonds, of which $972,300 are outstanding. They bear interest at the rate of 5 per cent per annum.

The contemplated bond issue is another step in the financing approved by over 90 per cent of the bondholders. During the two years that interest payment will be waived the company will be able to accumulate a fund of nearly $200,000 to be used for improvement and extension.

So far no word has been received by the company from the Public Service Commission in regard to the new bond issue, but numerous reports had to be submitted to the commission and it will take a little time for the commissioners to consider them.

Colorado to Tax Telephone Poles

The city council at Boulder, Colo., has passed a pole tax ordinance which levies an assessment against telephone and telegraph companies which maintain poles must pay 75 cents to $1.25 for every pole in the city and from 75 cents to 85 cents for every mile of wire. The difference in rate is due to the difference in character of the wire. The telephone franchise expired over a year ago and the pole ordinance is the outgrowth of the inability of the city and companies to agree upon a new franchise. The telephone company will have to pay to the city over $2,000 per year to comply with the ordinance.

Plan Uniform Toll Rates

Railroad commissions of Oregon and Washington, which control all public utilities in the two states, have begun a joint conference in Portland for the purpose of ascertaining how the basic telephone rates in the two states are determined and why the relations between various classes and qualities of service vary in larger and smaller communities.

The commissioners announced their investigation would result in the formulation of a plan of grouping and classification of rates and services that will be based on economic equality throughout the two states.

A tentative plan for arriving at such results was submitted by the Pacific Telephone & Telegraph Company.

It was expected that the readjustment would bring about a uniform schedule of rates in Seattle, Portland, Tacoma and Spokane, while secondary communities would receive a rate schedule that agrees for the same services rendered.

Restrains Michigan Commission

The Michigan state railroad commission has received word that the Consolidated Telephone Company, at Bad Axe, has asked the Huron county courts for an injunction to restrain the commission from enforcing its recent order compelling a physical connection with the Valley Home Telephone Company at a point in Huron county.

This is the second restraining order asked for by telephone companies seeking to restrain the commission from enforcing its orders.

Application was made in Detroit for an order to restrain a physical connection between the Bell and Citizens at Traverse City, the Wayne county court having issued a temporary injunction.

Chairman Hemans, of the commission, is sure that the courts will eventually sustain the order of the commission, going on the assumption that the Bayliss act will be held constitutional.

Canadian Progress

That continuous advancement is being made in every part of the province of British Columbia, Canada, is shown by the statement of development published monthly in *Telephone Talk*, the magazine issued by the B. C. Telephone Company. Thirty-nine telephone exchanges are operated and gains are recorded in nearly every instance, with very perceptible progress in the larger cities. Another article details extensions of outside plant which are in hand as well as additions to equipment in several of the offices. These are all on account of new business, indicating a live growth.

One of the feature articles in *Telephone Talk* this month is descriptive of Grand Forks and district. This city is fortunately situated, having fine prairie-like farm lands in its immediate vicinity, and the illustrations show that it is up to date and progressive.

Independent Progress and Prosperity

Installations and New Equipment

BY PAUL H. WOODRUFF

IT is a fact, used to illustrate many industrial arguments, that there are more bicycles sold today than there were sixteen years ago, although you seldom hear the word now, and everybody talked about them then. And it seems to me there is a curious analogy between the bicycle and the independent telephone business. Only a few years ago the very word "independent" could cause a furore of excitement in the telephone field. Men shouted it and fought and prayed for it and by it. Independent operating companies and independent manufacturing companies sprang up and flourished, while their leaders swore fealty and allegiance to its "cause." Even the laity caught the exhilarating infection and indignantly refused free service from the "trust" that they might contribute their mite as per schedule to the independent movement. Independent lines spread apace, until they numbered to a majority of all the service in the country.

Today the tumult and the shouting has died. The word independent is no longer exciting. Men talk of the telephone business without any special differentiation between the two service camps which were so long at war. So thoroughly has the calm descended, indeed, that some have been misled to believe that the independent movement has ceased its motion, or that it was afflicted with a commercial neurasthenia which sapped its vigor and made it a prey to imaginary calamities.

But it seems likely that this semblance of desuetude has been fostered and encouraged by an unfriendly influence. The army which has fought successfully in the open against a clever and merciless enemy need not be surprised to find its camp undermined and its water supply poisoned. So much the better for the enemy if its tactics be so subtle that they escape even suspicion.

At any rate the independents today are in better shape than they ever were before. They are giving the public service in place of sentiment, and they are making profits instead of noise. They have made their associations helpful to them where they were formerly helpful to their associations.

George Fitch says a team of horses hitched to a fire engine has a lot of motion, but it is mostly up and down. Independent telephony has lost most of its spectacular up-and-down motion and is now progressing steadily, if silently, forward.

Progress and prosperity in the telephone field mean more, of course, than a mere increase of business to the operating company. They mean new lines and possibly new construction on old lines; additional equipment increasing the capacity of the old, or perhaps new equipment throughout; more business for the manufacturer and more employment for the worker.

Of the fact that many of the independent operating companies which are saying least are "sawing wood" at a great rate we have plenty of evidence. Take, for example, the Federal Telephone and Telegraph Company's new automatic system, the story of which, by John D. Wells of Buffalo, we print next month. That in itself is strong testimony to independent enterprise.

But interesting as the Buffalo enterprise is, it is far from standing alone as an instance of independent progress. Down in Georgia the extension program of the Atlanta Telephone & Telegraph Company, involving an expenditure of $100,000 or more, is actively under way, and is progressing rapidly. Many carloads of material and poles have arrived in the city and are being placed. The first part of this extension will cover practically all of East Atlanta, and will center in a new branch exchange, for which a building will be erected on the northeast corner of DeKalb and Moreland avenues. The call word for this exchange will be "Moreland," and the territory which it serves will include Inman Park, Copenhill, Druid Hills, Edgewood, Kirkwood, Ormwood Park, and, in fact, all of East Atlanta.

The work is progressing rapidly and the company expects to have this new exchange in operation within thirty days. The East Atlanta work will be followed almost immediately by a carrying out of the extension program in other parts of the city. These comprehensive plans mean that the Atlanta Telephone Company will soon be able to offer its independent competitive service to patrons in districts not yet fully covered, and that the service in covering all of greater Atlanta will also become of greater benefit to subscribers who already use it.

In Indiana the Indianapolis Telephone Company has in operation a new exchange at Forty-fourth street, just east of Central avenue. The exchange is for the purpose of serving the rapidly developing territory east of Washington boulevard and north of Fall creek. A new two-story brick building, modern in style and equipment, has been erected. The arrangements include a library and rest room, kitchen and dining room for the operators.

The new switchboard, installed by the Automatic Electric Company, has an ultimate capacity of three thousand lines. It is of unusual interest on account of the extraordinary performance expected of it. The exchange is the latest thing in manual telephony and will have a number of new features, all of which are intended to quicken and improve the service. It mechanically eliminates the manual causes of delay through a traffic distributor, which in every instance will automatically carry the call of a subscriber to an operator who is not busy. For instance, if a subscriber's line comes in on operator's position No. 1 and the instant he makes the call operator No. 1 is answering another call, the subscriber is automatically and instantaneously switched to another operator, who can give the necessary attention to the call, thus saving the subscriber any waiting whatsoever, even to the fraction of a second.

Not only is this innovation introduced to save time and facilitate calls, but it is not necessary even for the answering operator to throw a key or insert a plug in order to get the call, as the subscriber's line

is automatically connected with the operator's talking set. The instant the subscriber takes the receiver from the hook on his telephone the operator should be asking "number" even before the subscriber has had time to lift the receiver to his ear.

Another new feature in this exchange is that the bell of the subscriber called will be automatically rung. In other exchanges it is necessary for the operator to throw a ringing key to signal the suscriber called. This is now obviated. The insertion of the plug for the line called automatically rings the subscriber every five seconds until he answers his telephone.

This prevents any possible neglect on the part of the operator in not ringing the subscriber a second or third time if he did not hear the first ringing.

The company opened the exchange to visitors soon after it was in operation, when the public had an opportunity to inspect these latest inventions in telephony. The Forty-fourth street exchange is said to be the largest and among the first of its kind in the world.

The Indianapolis company is also just completing a $50,000 fireproof addition to its main exchange building, which will contain a new central office switchboard and its operating department. In June the company had to issue a directory supplement containing 2,500 names secured subsequent to the issue of its regular directory in February.

In Terre Haute, Indiana, the Citizens Independent Telephone Company reports through its secretary and treasurer, A. L. Stadermann, that it is doing considerable underground construction and cable work to provide increased facilities, which involves an expenditure in the neighborhood of $30,000.

Estimates have just been approved for the expenditure of $74,256.70 in the Citizens Telephone Company's system at Grand Rapids, Mich., during the next six months. This work consists of installing of aerial cable and central office apparatus in the city of Lansing; aerial cable in the city of Holland, and underground and aerial cable and central office apparatus in the city of Grand Rapids. The Citizens Telephone Company now has 12,996 telephones connected in its Grand Rapids exchange. This is an increase since July 1, 1913, of 522 telephones.

The Home Telephone & Telegraph Company of Los Angeles, Cal., operates only in that city and immediate suburbs. The other cities and towns in Southern California from Santa Barbara on the north to San Diego on the south, have either locally owned independent plants, or companies in which the securities are held partly by local people or outside interests. All these plants, including the Home system are connected through the United States Long Distance Telephone & Telegraph Company. The telephones connected represent about 60,000 on the Home system and 45,000 outside. The local area covered by this company is about 9 miles by 15 miles, and subscribers are served through fourteen exchanges, all equipped with automatic switchboards, and in addition the private branch exchanges, with stations, are all manually operated, through a multiple manual switchboard in main office, and some trunking sections in the bigger exchanges. In the year from January 1, 1912, to December 31, 1912, the company gained 6,255 telephones, and 5,733 telephones in the year from January 1, 1913, to December 31, 1913. In the last two years the company has added four exchange stations in various parts of the city and suburbs, to divide and handle the business.

During the past twelve months the San Diego Telephone Company, California, has spent about $90,000 in expanding its system, both in increasing the size of the plant and in extending the lines. This includes the placing in operation of two new substations of 500 stations capacity, with an ultimate of 1,000 stations each.

The Union Telephone Company of Owosso, Mich., occupies a territory in the central part of Michigan and, being surrounded by independent companies, has very little chance for expansion or acquiring new territory. Nevertheless, it is developing its exchanges in this territory, and will probably put up thirty or forty thousand feet of cable and require several more crews of linemen in the performance of this work. It is re-adjusting its rates in various parts of its territory and most of these adjustments are upward. The company is entirely financed by the floating of common stock, and hence, as it enlarges sells additional capital stock. It never had a bond issue and only one kind of stock, common, and depends entirely on the sale of new stock to take care of the expense of additions and enlargements. It has never as yet found any difficulty in financing along this line.

The United Home Telephone Company, of Muskegon, Mich., is contemplating much activity in the way of development this year, and finds it necessary to apply to the Railroad Commission for an increase in capital of from two to three hundred thousand dollars, if it carries out its plans.

The company is waging a campaign of reconstruction on all its long distance lines, in a great many instances increasing the capacity considerably. In its territory between Manistee and Grand Rapids it is showing an increase in gross earnings over last year of about $1,000 per month.

The estimated cost for the new construction and improvements planned in the system of the Kinloch Company of St. Louis, Mo., approximate $1,000,000. A large part of the materials have been purchased and the company is now actually engaged on this work.

The Starke County Telephone Company of Canton, Ohio, is one of the properties which will be included in what is known as the Ohio State Telephone Company—the incorporation and intention of which our readers are familiar with. This new company contemplates spending between $2,500,000 and $3,000,000 immediately upon the extension and renewal of its property. The new work on what is now called the Stark County Telephone Company's property will include a new exchange at New Berlin, additional facilities on the Canton exchange, extension of the farm line system at Canton, and the rebuilding and extending of the Alliance exchange, and will necessitate the expenditure of approximately $100,000.

The entire property operated by the Consolidated Telephone Company of Hazleton, Pa., is about to be rebuilt. The company has a fine new common battery exchange just installed at Carbondale, Pa., replacing an old magneto system.

The Star Telephone Company of Ashland, Ohio, is building toll lines, putting up several miles of cable and constantly adding new subscribers at a good rate. It expects to spend in this work from $12,000 to $15,000 this year.

These are but a few random selections among items of information which have come to my desk within the last few weeks. A thorough canvass would supply similar material in quantities sufficient to fill

this number of TELEPHONE ENGINEER from cover to cover. And every issue carries in the "Brevities of the Business" department additional testimony to the fact that independent telephony is very much alive. Even a casual examination of the evidence should serve to dissipate for good any rumor that the independent movement is not moving.

Effect of Solar Eclipse

The forthcoming total eclipse of the sun, August 21, affords an exceptional and important opportunity of adding to existing knowledge of the propagation of electric waves through air in sunlight and in darkness, and across the boundaries of illuminated and unilluminated regions. The eclipse will be total along a strip extending from Greenland across Norway, Sweden, Russia and Persia to the mouths of the Indus. In Russia the duration of totality will be a little more than two minutes.

There are two main points calling for investigation during the eclipse. In the first place, the propagation of signal-bearing waves through air in the umbra and penumbra will probably obey laws different as regards absorption and refraction from those obeyed in illuminated air. In the second place, the strength, frequency and character of natural electric waves, and of atmospheric discharges may vary. The variations may occur either because the propagation of natural waves from distant sources is facilitated or impeded by the eclipse, or, possibly, because the production of natural electric waves or atmospheric discharges is for some unknown reason affected by the eclipse.

These points have previously been investigated to only a slight extent. The observers of signals during the solar eclipse of April 17, 1912, nearly all agreed that the strength of the signals was greater during the eclipse than an hour before or after. There was only one special observation of strays during the same eclipse, when very pronounced and remarkable variations were recorded during the passage of the shadow-cone across Europe.

To investigate the propagation of signals across the umbra it will be necessary to arrange for wireless telegraph stations on either side of the central line of the eclipse to transmit signals at intervals while the umbra passes between them. This transit of the umbra occupies about two minutes. It is thus very desirable that the Scandinavian and Russian stations should transmit frequently throughout several minutes before, during, and after totality. But stations other than those favored by their proximity to the central line should endeavor to keep a complete record of the variations of signals during the eclipse. Stations in Europe west of the central line and stations in the Mediterranean and in Asia Minor may find noticeable changes in the strength of signals, particularly long distance signals, between the hours of 10 a. m. and 3 p. m., Greenwich time; and it is probable that the stations of India and East Africa, and ships in the Indian Ocean, may feel the effect of the penumbra in the afternoon. On the other hand, ships in the Atlantic, and fixed stations in Eastern Canada and the United States will probably be affected by the penumbra in the early morning. At Montreal the eclipse (partial) is at its greatest phase at 5:52 a. m. standard time. It is possible that the eclipse may have some influence even when it is invisible.

The investigation of strays is of as great interest as that of signals. So far as is yet known, the natural electric waves reaching wireless telegraph stations in latitudes higher than 50° appear to travel mostly from the south. Thus the greatest changes produced in strays by the eclipse will probably be experienced at stations in Scandinavia and Russia, to reach which the waves must cross the path of the umbra. At the same time changes of some kind are to be expected in other districts than these, and it is therefore desirable that statistical observations of natural electric waves be made all over the world, and especially at places within an earth quadrant of Southern Russia. It is also desirable that meteorological observations, including those of atmospheric ionisation and potential gradient, should be at the disposal of the committee considering the records of strays and signals.

The Committee for Radiotelegraphic Investigation of the British Association for the Advancement of Science proposes to prepare and circulate special forms for the collection of statistics of signals and strays, especially within the hemisphere likely to be affected by the eclipse; it will endeavor to make provision for the transmission of special signals at times to be indicated on the forms, and will offer for the consideration of the authorities controlling stations near the central line a simple program of work. The discussion of the observations, and the comparison with meteorological data, will be carried out by the committee; and digests of the statistics, together with the conclusions drawn from the analysis, will be published in due course.

An English Telephone Call Meter

As a result of numerous complaints from telephone subscribers the British post office department has evolved a simple checking meter which can be installed at the subscriber's end of the line. A high resistance (4,000 ohms) electromagnet, entirely copper clad, actuates a Veeder dial through the usual mechanism.

It is connected betwen the ringing side of the line and earth and is so arranged that, as the armature is attracted, the circuit of a 1,000 ohm resistance in parallel with the 4,000-ohm winding is closed, and an augmented current flows over the line. This current, when augmented, passes through a relay at the exchange, lights a lamp on the switchboard, and so indicates to the operator that the call has been recorded at the subscriber's end.

The subscriber's meter is worked by the operator by the same meter key through a relay in the existing cord circuit, which connects an 80-volt battery to the answering relay between the line and earth. The subscriber's meter is not affected by the usual ringing current, as the copper covering of the coil gives it sufficiently high inductance to prevent any considerable alternating current from passing through it.

The meter is no more likely to register ineffective calls than the one at the exchange, in conjunction with which it works, and is dependent on the operator to the same extent. The subscriber can, however, immediately notify the exchange if he sees an ineffective call registered.

New telegraphs and telephone regulations became effective in Roumania the first of the current year. The law establishes a yearly rate of 100 francs ($19.30) for 2,000 calls and for every call above that number 10 centimes (about 2 cents) a call. Subscribers having more than 8,000 calls are required to have two trunk lines.

Appraisal Question in New York

The New York Telephone Company still insists that no rates for the city of New York can be equitably arrived at by the second district Public Service Commission, unless the entire property of the company both within and without the city of New York be inventoried and appraised, involving a tremendous amount of work and more money than the $100,000 made available by the last legislature.

The commission does not accord with this view and its special counsel, D. B. Murphy, together with William McClellan, recently appointed confidential engineer for this work, are now engaged in a study of the situation based on a preliminary survey of the problem made by the committee for the appraisal of its property appointed by the telephone company, of which F. B. H. Paine is chairman.

In forwarding this preliminary survey of the company's metropolitan property, Mr. Paine and Mr. Swayze, general counsel to the telephone company, still maintain that it is not possible so to separate the use to which this property is put respectively for toll and local exchange service as to give a basis for making local rates which will stand in the courts.

Pending some settlement of this issue, the experts for the commission, as well as the company's committee on the appraisal, will go on with the details of estimating the value of the company's physical property in New York city. It is the hope of the commission that the whole matter will be settled before the convening of the next legislature will make possible the passage of mandatory rate legislation.

Discrimination Problem in New York

The Public Service Commission of New York, second district, has rescinded its recent order by which the telephone companies of New York were compelled to cease granting certain rates which the commission considered discriminatory. The withdrawal of this order at this time is due to the fact that the original order was so broad in its promise as to comprehend cases which the commission did not contemplate reaching.

The original order was aimed at the practice of giving free or reduced rate telephones to favored individuals in certain localities, such as village, town and city officials. The original order was so phrased, however, that a telephone company was enabled thereby to insist on the raising of a large number of rates throughout the state, effecting considerable hardship on telephone users.

A telephone company, as an instance of this, in one community where it had less than 5,000 subscribers served notice that the rates in 1,900 cases would be raised. The original order of the commission contemplated reaching only a dozen or less cases in this community. The following statement was made by the commission with regard to rescinding its order:

When the commission made its recent order requiring telephone companies in New York state to terminate preferential contracts and to charge all their patrons the same rates for similar service in accordance with filed schedules, the primary purpose it had in mind was to put an immediate end to certain abuses which have grown up in connection with the granting of local telephone franchises throughout the state.

It has been customary to incorporate in such franchises provisions for free telephone service to a large number of local officials, and the practice seems in some cases to have been stretched so far as to give rise to the suspicion that a large number of people, prominent in their several localities, are enjoying free telephone service in return for assistance which they were able to give the companies in obtaining their local franchises. Whether or not such a suspicion is justified, it seemed to the commission that in fairness to the public at large the practice of more or less indiscriminately giving free telephone service to local officials throughout the state should be stopped.

In making our order we had in mind also the speedy termination of certain preferential contracts which were plainly illegal, and for permitting the continuance of which the telephone companies are probably liable under the law to the imposition of penalties by the state. With these obvious instances of improper practices in mind, the commission felt justified in moving in the matter as it did in somewhat summary fashion.

No hearings were held prior to the making of the first order. Since its promulgation, however, it has come to the attention of the commission that the scope of the order was so broad as, perhaps, to include a large number of cases where those affected by the ruling should in fairness, at least, have an opportunity to be heard. Moreover, we have already found that in the case of several companies suspension orders covering periods of as much as six months in some cases will apparently have to be made on account of special circumstances which would prevent any earlier compliance with the commission's first order.

For these reasons, and for the further reason that the pending investigations into the rates for telephone service in New York will afford an excellent opportunity to take up questions of this kind in an orderly way, the commission has decided to suspend for the present the operation of its order in cases of alleged discrimination and preference.

The order of suspension also directs the telephone companies to file with the commission additional information respecting all such cases. A requirement of this kind was incorporated in the first order, but it is now somewhat amplified, and in its present form will enable the commission to eventually make an order that will stop the unlawful practices against which the first order was directed without doing any incidental injustice to other telephone users.

Texas Independent to Buy Local Bell

J. E. Farnsworth, vice-president of the Southwestern Telegraph and Telephone Company, stated that arrangements have been completed for selling out the exchange of the Southwestern Company to the Brazos Valley Telephone Company, at Waco, in case the city commission shall approve the transaction.

No definite price has been set on the plant. It is expected to base the price on an inventory, the details of making which have been arranged. The agreement is if the people of Waco and the city authorities approve, the exchange of the Southwestern Company will be sold to the Brazos Valley Company. The Southwestern Company will retain its long distance lines through the city, binding the independent company to furnish it with all the facilities necessary to handling the long distance business adequately.

Not less than $250,000 in improvements above cost of buying the Southwestern plant is demanded to be expended in the erection of a new building, installation of new switchboards and apparatus and a general revamping and extension of the two plants.

The city commission, in approving of the consolidation, if they decide to do so, will be requested to incorporate in their resolutions these same demands. The interests of the city and those of the Southwestern Company are identical; the city must protect its citizens in seeing that the most efficient long distance service is at their command, and the Southwestern Company must protect and develop its business by demanding the same guarantees.

The 17th annual picnic of the employes of the Scranton Button Company at Lake Ladore, Pa., was the occasion for the issue of a very handsome folder program.

The Betulander Relay-Automatic System

New Method of Automatic Switching Described by The Electrician

A VERY interesting system of automatic telephony is now on view at Marconi House, in London. The plant, which is the first exchange erected on this system, is part of a 10,000-line exchange, to which are connected, for the purpose of demonstration, about 20 lines. The system is the invention of two Swedish engineers, Messrs. Betulander and Palmgren, and the present plant is under the direction of C. B. Clay and A. Williamson, who are managers of the Betulander Automatic Telephone Company. The system is unusually interesting in that it marks a departure from the hitherto adopted forms of electro-mechanical movement in automatic telephone systems.

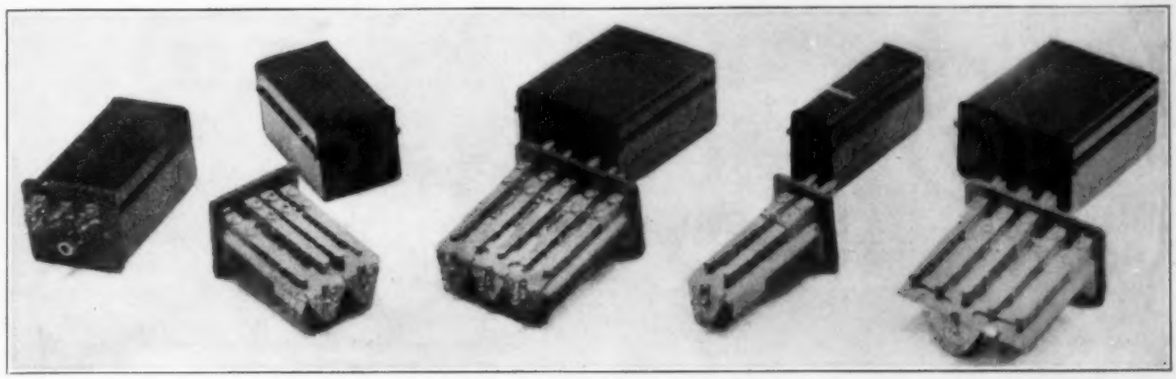


Fig. 1.—Types of Relays Used in the Betulander System.

In general it may be said that automatic telephone systems are capable of division into roughly four classes. In the first we may place those that use electro-mechanical devices which have movements in two directions (vertical and rotary), and which are also self-starting. Under this class come the Strowger and systems based upon it. In the second class we may place systems having movements in one direction and in which the contacts are mounted on a drum, and which are machine started or driven to a certain extent. The Lorimer is an example of a system coming under this class. Under class three may be placed electro-mechanical devices which have movements in only one direction, and which are self-starting. In this class there is no friction of the wipers over contact of idle lines. An example of this is the Betulander Company's automatic selector system, which was described in TELEPHONE ENGINEER for August,

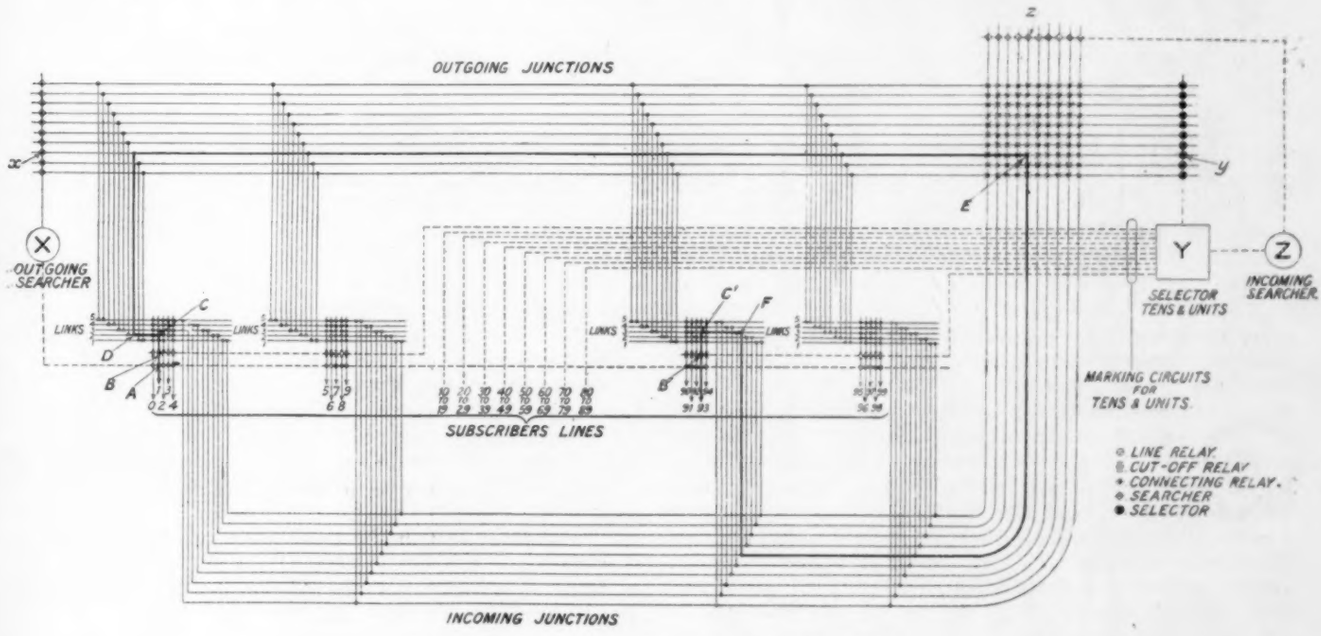


Fig. 2—Diagram Showing Principle of Betulander System.

1913. In the fourth class are those systems which have no electro-mechanical device, and are operated entirely by relays. The Betulander relay system is the first and, at present, the only system that can be placed in this division.

It has several distinctive features which cause it to stand apart from all other automatic systems. In the first three classes we have mentioned the electro-mechanical devices, after performing their legitimate functions of selecting and indicating the idle junction and subscribers' lines, remain associated with the completed connections and consequently are doing no useful work during the period of conversation. With the Betulander system, however, the selector and common

To show the principle upon which this system works a special diagram (Fig. 2) has been prepared. This represents a skeleton of a 100-line relay system. To build up a connection on a 100 or 100,000 line system the trunks or junctions joining up the different groups are connected by "links," which perform the same function as a pair of cords on a manual system. The first, or "primary link," takes the place of a line switch or preselector on other systems, and acts in a similar manner automatically to extend the calling line to the first junction when the receiver is lifted. The following links connect junction to junction, and finally the last junction to the subscriber wanted in response to digit impulses.

The subscribers' line terminates in a line and cut-off

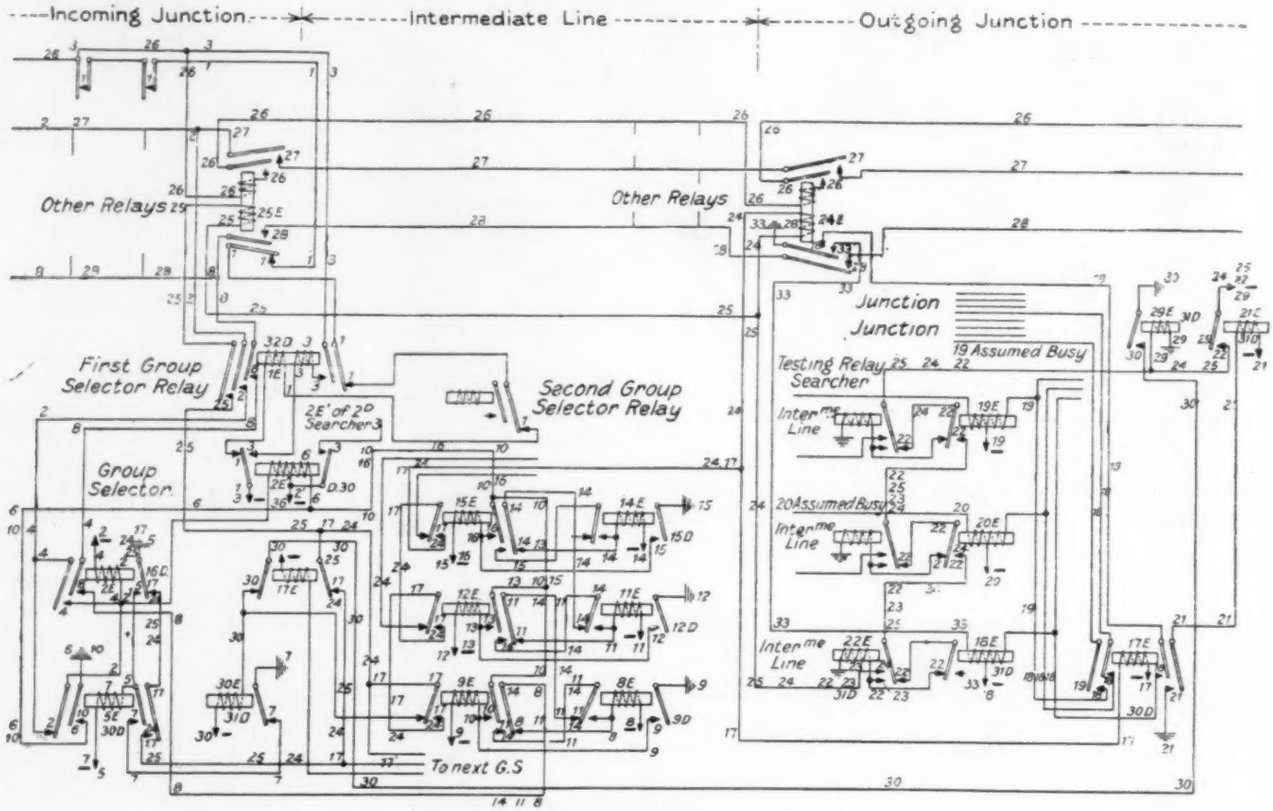


Fig. 3.—Connections of Relay Selector and Searcher.

relay units, which are equivalent to the electro-mechanical devices in other systems, after performing their respective functions are automatically cut out of circuit, and are available immediately for building up other connections.

The units, by means of which the Betulander system is operated, are relays of the ordinary telephone type which have been used in the central battery manual exchanges throughout the world for the last 15 to 20 years. They are simple and well-tried units, and are thoroughly reliable. A few of the various types of relays used in a Betulander switchboard are seen with their cases in Fig. 1. The absence of moving parts, as generally understood, means that the liability for these to get out of order through the wear and tear of ordinary working, is reduced to a minimum. Relays entirely control the talking circuit from subscriber to subscriber and return all sections to their normal condition when the receiver at the subscribers' end is replaced, so that there is no frictional wear of any kind.

relay (*A* and *B*, Fig. 2), and also has associated with it as many relays as there are primary links, five being shown in the diagram. The five horizontal lines are the links, the five transverse central lines are the subscribers' lines, the vertical lines to the left are the outgoing lines, and the vertical lines to the right are the incoming junctions. The five subscribers have thus access to 10 outgoing junctions, and the subscribers can be reached over one or other of 10 incoming junctions. This combination is spoken of as a subscribers' unit. Twenty such units, or more or less according to the traffic requirements, may have access to the same junctions.

Associated with a group of lines is a common "searcher" and a group of relays which, when a receiver is lifted to call, prepare a path past all engaged lines, so that an impulse from the searcher initially energizes two relays on idle circuits to connect the subscribers' line with the link and the link to the junction. The searcher is then cut out of circuit, and the connection is

held over the subscriber's line. The searcher performs this function in about one-eighth second, and is then free to deal with other calls.

With intermediate links an impulse-responding device is fitted in addition to the searcher, which responds to the digit impulses and selects a particular group of junctions in which the searcher performs the beforementioned functions.

At the terminal junction simultaneous connection is made by the searcher at three points. As shown at *E* (Fig. 2), to allow of great flexibility, the junction lines intersect with secondary links, relays being fitted at the points of intersection and extend the junction to the incoming side of the primary link as before described. Connection is made at the point *E* and at two points on the primary link at the same time.

It will perhaps be simpler if we point out in Fig. 2 the actual operation of the relays in connecting subscriber No. 1 to subscriber No. 93, and then describe from a wiring diagram the actual connections employed in certain parts of the operation. On subscriber No. 1 taking his receiver off the rest a line relay, *A*, associated with his line, will operate and start the outgoing searcher *X*, comprising a small group of relays. The purpose of this outgoing searcher is to find an idle outgoing junction, and then to effect a connection between the calling subscriber's line and the idle junction thus found. If we suppose junction lines Nos. 1 and 2 are busy, the guarding circuit of the connection relays *x*, belonging to each outgoing junction, will give an earth to the searcher relays, which in response will pass the marking current to the connecting relays of the next idle junction. These searcher relays have determined that No. 3 outgoing junction is idle, operate No. 1 subscriber's cutoff relay *B* and also the two connecting relays *C* and *D*, on link No. 2, corresponding with No. 1 subscriber and No.

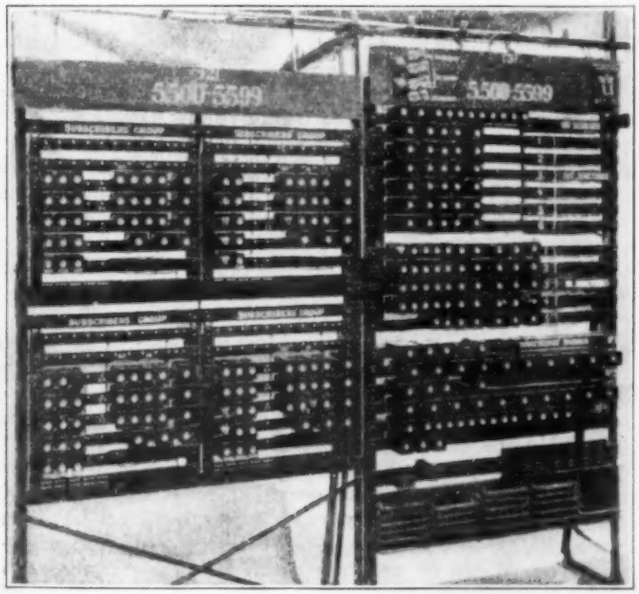


Fig. 4.—View of Two Switchboard Sections on the Betulander System.

3 outgoing junction. As previously mentioned, the outgoing searcher does its work almost instantaneously, and then is cut out of circuit by the relay *B*, and is, therefore, ready for another call. The relays *B*, *C* and *D* are pulled up by a marking current sent out by the searcher; immediately they are pulled up the marking circuit is broken and the relays are held up through the retaining circuit.

Subscriber No. 1 is now extended by relays *A*, *B*, *C* and *D*, and the selector relay *Y* to the tens and units

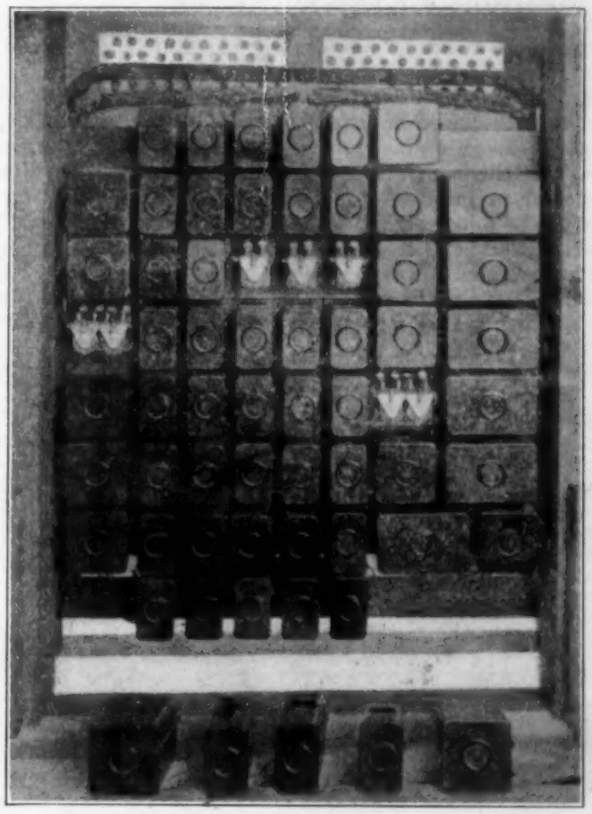


Fig. 5.—Front View of Switchboard Section for 100-Line Exchange.

selector. These operations have taken place in the fraction of a second following the telephone being taken off the rest. The impulses which determine the number required are then sent out and received by the selector; the impulses are sent out entirely through the mechanism of the calling instrument, which is described later. First, ten "tens" impulses will be sent, and this will result in the 90-99 marking circuit being chosen by the selector. Each impulse has the effect of pulling up an armature of the selector relays, so that the current will stop in this case at the tenth relay. The break following the completion of these ten impulses will result in the selector preparing the "unit" relays for the reception of the "unit" set of impulses, the tenth relay in the meantime being held up by the retaining circuit. The fourth "unit" impulses will then follow, and will result in the fourth subscriber, *i. e.*, No. 93, in the 90-99 "ten" being marked as ready for connection with an idle incoming junction.

The incoming searcher *Z* now comes into operation, and by a relay, *z*, searches out an idle incoming junction; in this case No. 5, in the same way as the outgoing searcher, establishes a connection from No. 1 subscriber to No. 3 junction line; the incoming searcher establishes a connection *via* relays *E*, *F*, *C'* and *B'* to instrument 93 and is itself automatically cut-out by the subscriber's cut-off relay *B'*. It can now be seen that subscriber No. 1 is connected to subscriber No. 93 by five connecting relays *C*, *D*, *E*, *F* and *C'*. Ringing is now automatically

applied to the called line for operating the bell, and on the called subscriber answering the standard talking circuit connects the two subscribers. If No. 93 had been engaged No. 1 would have received the busy back in the usual way.

Referring now more to the actual circuits employed in performing these operations, the Betulander relay system of working is equivalent to "double cord" working. This can be seen in Fig. 3, which shows a circuit diagram of the relay selector and searcher. Here *25E* represents the connecting relay to join a subscriber's line or an incoming junction to a link, and *24E* relay to join the same link to an outgoing junction. Two selector or impulse-responding devices are usually fitted at the terminal end to respond to the two last digits of the number called. An earth on the third or holding wire operates a selector control relay *1E* over the circuit marked *1*, which extends the earthed wire *2* to relay *2E*, which is energized, as is also *2E'*, which is in parallel.

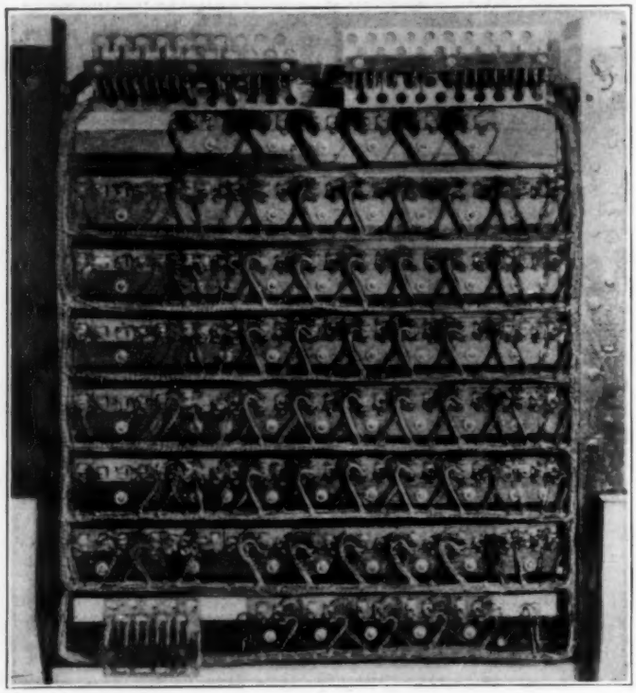


Fig. 6.—Back View of Betulander Relay Switchboard Section for 100-Line Exchange.

Circuit *3* forms an independent holding circuit for relay *1E*. Relay *5E* is energized over circuit *5* and locks itself over circuit *7*. The circuit has now been prepared for the impulses which are sent over the wire *8*. The first impulse is over the wire *8* to energize relay *8E*, which completes a circuit for *9E*, which locks itself in a local circuit. The second impulse is over lines *8* extended by *11* to energize *11E* which completes a circuit for *12E*, which locks in a local circuit. A third impulse would similarly energize *14E* and *15E*.

It is assumed that the digit *3* has been called. Earth is now removed from line *2* and relay *2E* de-energizes and connects earth to wire marked *17*, which by various contacts of relays energizes group relay *17E*. This relay connects the test wires of a group of lines to test relays *18E*, *19E*, *20E*. Relay *19E* is assumed energized by an engaged junction, *20E* is assumed energized by an engaged link. Relay *17E* also connects up the current-emitting relay *21E*, which completes a circuit for *22E*, as shown by line *22*. Relay *22E* completes an initially energizing circuit for relay *24E* to connect the link to the outgoing line, the circuit being as marked *24*. Relay *24E* by line *18* energizes relay *18E* to mark the circuit as engaged against other callers. Relay *22E* also completed the initially energizing circuit for relay *25E* by line *25* to connect the incoming wire with the link. Wire *3* now forms the holding circuit through windings of *24E* and *25E* by *26*. Wires *27*, *28* show the line circuit joined through. The selector and searcher relays are disconnected and return to the normal in readiness for another call. Similar figures identify a circuit from end to end so that further details can be readily traced.

The subscriber's apparatus at present used in the Betulander system is similar to that used in the Betulander automatic selector system. The desired number of impulses are sent according to the setting of four keys, which move in slots cut in the circular face of the apparatus. The slots are divided up and numbered from 0 to 9. Each key is mounted on a toothed disc fitted with a spring and rachet device which engages with an oscillating beam. This beam moves the contacts of springs by means of which the impulses are sent. To call, say, 5673, the first or "thousands" key would be moved to the position marked five, the second to the position six, the third to seven and the fourth to three. The receiver would then be removed, which would release the ratchet device, so that the first key would start operating. The "thousands" disc would consequently give five impulses to the oscillating beam which through the springs would send five impulses to the selector at the other end. Following the last impulse a bigger tooth engages with the oscillating beam, which is pushed farther over than usual, and operates an extra contact on the springs. This causes a break in the circuit which prepares the selector to receive the "hundreds" impulses. Immediately the "thousands" key comes to rest the "hundreds" key is released automatically, and the six "hundreds" impulses sent as before. In the same way the tens and units impulses would follow.

The dial form of sender may be used, but the form described has many advantages. No apparatus or lines are engaged until the receiver is lifted, as the number is set up prior to this; whereas on other systems the number is dialled after the receiver is lifted and consequently, if the operation is delayed by the caller being interrupted or referring to the directory, the caller's line will test engaged and junctions be hung up unnecessarily.

Every subscriber is provided with a meter, which records the number of completed calls he makes. There is a meter on each searcher or selector so that a complete record of all the movements of the various parts is available for the engineers looking after the plant.

Some idea of what a switchboard of the Betulander system looks like can be obtained from Fig. 4, which shows the relays for a portion of a group of 100 lines in a 10,000-line exchange. At the top of the right-hand board can be seen the group of relays which comprise the outgoing searcher. Below these are the relays connected with the out-and-in-junction lines. The subscriber's marker, which receives the "tens" and "units" impulses sent by the calling instrument, is seen below these, and the incoming searcher is composed of the bottom group of relays. Four subscribers' groups are seen on the left-hand board. At the right-hand end of the out-searcher is seen the recording instrument

which registers the number of times the out-searcher operates.

The other illustrations, Figs. 5 and 6, show the front and back of part of a board on a 100-line exchange. In Fig. 6 the neat way in which the wiring is executed can be seen. Although apparently tremendously complicated, the wiring is built up in several stages, and the actual connecting up is a matter of comparative simplicity with the aid of specal diagrams.

The advantages of a system operated entirely by relays are obvious after a little consideration. Problems with which the engineers of most automatic systems have to contend are the protection of the apparatus from heat and damp, and the adjustments which have to be made for the wear and tear of the moving parts. Being compact in form, relays are conveniently covered by dust covers, without preventing ready access to any portion of the plant, so that the relays can be protected from moisture and damp. Thus for hot or damp countries this system has a very considerable advantage over any other. Relays, as has been proved by experience in common-battery exchanges, require very little adjustment, and are also familiar units to the staff of a telephone system.

Producing the Best Permanent Magnets

To produce permanent magnets, which are both powerful and constant in their power, a tungsten steel should be used having from 5 to 8 per cent of tungsten, and from 0.4 to 0.6 of carbon, says Silvanus P. Thompson. Chromium up to 2 or 2.5 per cent may be present, but the presence of the following elements should be avoided: manganese, titanium, copper, sulphur and phosphorus.

For bar magnets there is an advantage in having the dimension-ratio as large as possible, as this gives not only a higher permanence, but a lower coefficient of temperature variation. For horse-shoe magnets, and for all those which are to be used in instruments where extreme constancy is required, the gap between the poles should be as short as possible, and the polar areas should be as large as possible. From the point of view of constancy, there is an advantage in having a considerable stray flux (through a magnetic shunt or otherwise) in addition to the useful flux.

The forging of the magnet, whether bar or horse-shoe, should be done with as little working of the material as possible, and at as low a temperature as is convenient. After forging, to normalize the material it should be heated to 900 deg. Cent., lowered to 750 deg. Cent., and there maintained for a time, then cooled off. To harden the magnets, they should be raised to 950 deg. Cent. for a period not exceeding 5 minutes; and then lowered to about 700 deg. Cent., and quenched at this temperature in brine, or at a temperature under 20 deg. Cent. Some brands of high tungsten steel appear to yield a better result if quenched at some temperature between 770 deg. and 850 deg. Cent., or even at higher temperatures.

With tungsten steels there appears to be no advantage whatever in tempering the steel. With carbon steels there is no advantage in tempering the magnet if it is one having a small dimension-ratio (as for short bars). But bar magnets of carbon steel, if their length is as much as 20 diameters, may be tempered to a straw tint, or if as much as 40 diameters long, or more, they may be let down to a blue tint, and will then receive more magnetism. Any letting down below a straw tint, however, impairs their power to resist decay and usage.

The magnets should then be matured either by boiling or steaming them for 10 or 12 hours, or by heating them to 60 deg. Cent. for 20 or more hours. There is some advantage in letting them cool several times during this process. For a magnet that is intended to be used at some particular temperature, and is required to be as constant as possible at that temperature, there is some advantage in subjecting it to a number of cyclic processes of alternately heating it to a few degrees above, and cooling it to a few degrees below, that temperature at which it is intended thereafter to be used.

The magnet should then be magnetized by means of an electro-magnet, or, if a bar magnet, in a powerful magnetizing coil, to the highest degree of magnetization possible. There is some advantage in reversing its magnetism a few times. There is no advantage in magnetizing for a long time, as the result depends on the maximum magnetizing force applied, and not on the duration of the application. But in the final magnetization, the magnetizing current should not be suddenly switched off, but should be diminished gradually to zero. There appears to be a slight advantage in subjecting the magnet during magnetization to mechanical percussion, by striking it with a hammer of brass or other non-magnetic hard material.

For magnets that are to be given extreme constancy, there is an advantage in then slightly reducing their magnetism by subjecting them to demagnetizing forces, a reduction of from 5 to 10 per cent being sufficient. It is doubtful whether this process is necessary for magnets the form of which is a closed circuit with a very narrow gap.

Just as the thermal stability of a magnet is best assured by subjecting it to small cycles of heating and cooling about the point of temperature at which it is thereafter to be used, so its magnetic stability is best assured by subjecting it to small cycles of demagnetizing and remagnetizing force about the point of magnetization at which its magnetism is thereafter to remain constant. It would, indeed, be advantageous to repeat this small cycle several times over, so as to bring the magnetic state into a final condition, where the effects of any accidental external magnetic influences will be a minimum.

Not Much Money in Wireless

M. L. Justin admitted in the Federal District Court that he had acted as president of three companies, the Atlantic Radio Telephone Company, with a capital of $2,500,000; the Pacific Radio Telephone Company, with the same capital, and the Great Lakes Radio Telephone Company, with a capital of $1,000,000, for a weekly wage of $25. His testimony was given at the trial before Judge Hunt of James Dunlop Smith, Lee de Forest, Samuel E. Darby, and Elmer E. Burlingame on the charge of having misused the mails to defraud.

The three companies mentioned were subsidiaries of the Radio Telephone Company, and it is the contention of the government that they were formed to raise the money in order to pay the dividends declared on the Radio Telephone Company.

The telephone line between Christiania and Hammerfest, Norway, has been completed as far as Harstad. The distance between Christiania and Harstad is about 500 miles.

The "No-Account Department" of the Business

Address Before the Tri-State Independent Convention, Jackson, Tenn.

BY W. S. VIVIAN

THIS title—the "no-account department"—has been assigned as a suggestion of the value of the traffic department as it is considered by altogether too many of our smaller and even some of our larger companies, as is proven by the lack of selection, instruction, training, compensation, conveniences and cheerfulness of surroundings of employes of this very important, if not the most important department of the telephone company.

W. S. Vivian.

It has been the writer's privilege to meet many hundred operators during the past few years, operating in different states and under all kinds of conditions. He has always found them eager to learn better and more efficient methods of transacting their work, but altogether too often he has found that they have had absolutely no instruction or training. These are the days when he who would be successful must train in his particular line until he becomes both a scientist and an artist. Neither is complete without the other. Science, we find, is organized knowledge, while art consists in the doing of the thing in the best possible manner. Notwithstanding this fact, we of the telephone fraternity go about our work altogether too much on the hit or miss plan. We have just one thing to sell the public, namely, service. It is generally recognized that the problem is a question of service rather than price, or in other words, the better the service the better will be the price that can be secured. The operator is the one and the only one who is constantly and everlastingly serving the public, and not only that, but serving them in all of their varying moods. It is not the manager nor the officers of a company who establish the company's reputation for service, good or bad; it is the operator. It is not the manager who has to serve the public when they are angry, unreasonable and ofttimes insulting, but the operator. At that the manager ofttimes has reason to think that even he gets some hard ones. The great difference is he has an opportunity to meet his complainants face to face, in fact does so. In such cases the average person is reasonably careful of what he says. The operator, however, meets them only over the wire. There is usually a wonderful difference in the manner, voice and language used in registering such a complaint. It is sometimes said that an operator can lose more business in a month than a solicitor can secure in several. As a principle I believe this is correct.

I believe the operator when properly trained can become one of the most important factors in the successful operation of a telephone property, which will have a reputation of furnishing good service at a fair price and which pays a fair dividend regularly. Such a company would have little, if any, trouble in finding buyers for its securities.

If then the operator is important, let us give her department the attention it deserves and the credit which is its due. First the environment, cheerfulness of surroundings and equipment should be maintained in the best possible manner. This means the operators' room should always be neatly decorated, kept clean and well ventilated. A few selected plants will help in producing a cheerful effect. The switchboard itself should be kept clean, polished and in the best of repair. This will do two things:

First, the operator's surroundings will be attractive, cheerful and wholesome.

The operator has good tools (equipment) to work with. From the applicant's point of view the surroundings will be attractive and favorable.

No one really likes dirt, filth or dinginess, but still I have been in operating rooms, as perhaps you have, of which this description would be conservative. The writer was in an operating room a short time ago where years before the walls and ceiling had been papered, but during the years, little by little and piece by piece the paper had come off until at this time there was scarcely any left on. The manager stated he had been trying for two years to get authority to have the room papered. The total cost would not have exceeded ten dollars, as the room was small. I don't know what you think, but this sounded like false economy to me.

With the operating room and equipment in shape the applicant should be carefully considered. Character is the first essential. This can be determined in two ways:

First, by the general appearance.

Second, by suitable references.

Character, to my mind, is of supreme importance. Altogether too often we hear the phrase, "She is only an operator." For some reason, in our larger offices especially, an operator is not considered as being on the same plane in society as the clerk, stenographer or saleswoman, and I believe this distinction is brought about because the telephone companies as a whole have been too lax in the personnel of the applicants employed.

A plan that is found to be practical and reliable is to have a committee from the force to whom each applicant will be referred to for investigation. It has been proven that where such a committee has charge of this matter undesirables have seldom been employed.

This also has a beneficial effect on the employes, as first of all it convinces them that the company is interested in their welfare, regards them as a part of the company and gives them a voice in assisting to secure the most desirable fellow employe.

The second important qualification is health. In employing an applicant you want one who will be on the job every day, one who will not call up the chief operator a few minutes before or a few minutes after time to report and say that she is sick and unable to come to work.

The next qualification we would recommend is the age of the applicant. A young woman of seventeen or

eighteen years of age, everything else being considered, will make the best operator because she is more apt at learning the work, quicker in action and will more readily conform to the rules and regulations governing her work.

The other necessary qualifications are, of course, good hearing, good sight and ability to do the necessary reaching in putting up and taking down connections.

In the foregoing I have purposely refrained from mentioning the voice. The voice of an operator is of tremendous importance. As we meet each other at a time like this or in the usual walks of life, we not only hear the voice but we see the facial expression, the twinkle of the eye, the smile, feel the clasp of the hand, and we are able from these usually to form correct impressions. The voice may be harsh and rough, but still we recognize that back of it is a kindly spirit and a friend. If we deal with such persons over the telephone we know that he is a friend, although we hear only the harsh voice. If we deal with a stranger over the telephone and the voice is discourteous and unfriendly, we do not have the best impression of the individual.

The operator is the saleswoman of the telephone business and the impression the public has of the company is moulded largely by the operator. She is known as an operator to the general public and not as an individual like you or me. The public do not meet her face to face, they hear her voice, therefore, it is of importance that her voice be trained so that it will carry the same cheerfulness, friendliness and interested attention that a personal interview would under the most favorable circumstances. This effect generally can be produced only by systematic and persistent training and practice.

I know of an office where the chief operator drills her force systematically with a view of developing the proper voice qualities. Her method is to place an operator at a telephone where she can talk to her from another telephone. If the operator is a local operator they go over the phrases used in the local work, if the operator is a long distance operator she goes through the work of recording, testing the circuits, passing the tickets, the uses of codes, etc. The chief operator in this instance becomes the ideal and a model. The operators are expected to repeat the work in the same tone of voice that is used by the chief operator. The result is twofold.

First, the ideal voice is developed by every operator in addition to a uniformity of voice of all operators.

Second, the operators acquire the correct way of performing their duties to the exclusion of other ways thus producing systematic work which gets results.

There are numerous other qualifications which the chief operator must be ever on the alert to develop such as dress, general deportment, etc.

Every office large or small should have a chief operator and every chief operator should be furnished equipment consistent with the size of the office so that she may have proper supervision.

Generally speaking, in exchanges where multiple boards are used, it is economy to provide an up-to-date chief operator's position, which will be so equipped that she can supervise the work of every local and long distance operator without the individual operator being aware of it.

The chief operator should be held responsible for the efficiency of her department. She should know the number of calls per day, the number of calls each individual operator is handling, whether her schedule is as efficient as it might be or not. She should aim to have a force on duty all the time competent to handle the work and still have each operator work to 90 per cent efficiency. Too many operators on duty at one time is nearly as injurious to the service as too few operators. It has been proven that the service will be better and quicker where every operator is working pretty close to efficiency than otherwise.

The discipline in the operating department must necessarily depend somewhat on the size of the office, but it is safe to say that in every office where there are two or more operators employed the discipline must be such as will produce the best results.

Then the selection of the operator and methods of work adopted must naturally depend a great deal upon local conditions, still through it all we should aim at the ideal. In the long distance field, conditions are quite the reverse because of the fact that the operator is dealing with operators in many different towns and the work of necessity must be uniform if we are to get results. In any territory where each office handles the long distance work according to some system of its own, and that system is different from the other offices with whom it is doing business, we do not hesitate to say that 75 per cent of the work is useless and wasted, in that it is unnecessary. And not only that, but if it is unnecessary the circuits are occupied with useless work and efforts and other messages are waiting and unable to get through. Sufficient experience along this line has been had so that we can make these claims as facts and not as theories.

One of the large independent companies in its annual report stated that by adopting a system of work as outlined in our standard long distance operating rules it was able to handle a greatly increased traffic over the same circiuts with less congestion than formerly. The secretary of another large company after getting in on the circuits and listening for an hour to the manner in which the work was being handled and comparing that with the system of work as outlined said, "We are losing thousands of dollars," and his company immediately adopted a system of work and followed it out vigorously.

In the past I believe many have looked upon the traffic department from the side of its expense, rather than from the side of it being a revenue maker. Too often it is an expense, but in every such case when the conditions are found out, one learns that absolutely no attention has been paid to it. In such instances they have figured that if a girl was at the switchboard that was all that was necessary. Today, however, we are coming to a new situation. The progressive companies of a state or given territory bring their operators together in operators' schools where the girls become acquainted with each other and where the work is gone over with them in detail. At an operators' school held at Fort Wayne, Ind., there were two hundred and twenty-eight operators and managers registered in the proportion of about twenty-eight managers to two hundred operators. The result of a meeting of that kind is that they all find the business far bigger, more interesting and with greater possibilities than they had ever imagined, they become enthused with their work and go back to their respective exchanges, put the plans into operation, and the result is a greater efficiency in the handling of their calls, a greater capacity and a greater revenue so that the companies find that the few dollars spent in traveling expenses pay them the biggest returns of any money they have ever spent.

After the first school is held usually they immediately begin to plan for a second.

It is important that the independent companies all through this country should adopt uniform methods of

handling their work, such as will produce the greatest results with the least possible amount of effort or expense. The traffic department can become just what we make it. If we give it its rightful place, this so-called "no-account department" will become the most important department of the company, the companies will have a reputation for good service and the subscribers will be satisfied. A satisfied subscriber means a good word for the company every time an opportunity offers and that means more subscribers and greater earnings.

A Reminder for the Wire Table

Although the following simple relations in connection with the Brown & Sharpe gauge wire table are not new, they will be of great service to anyone who has occasion to make frequent calculations involving certain data given in the wire table where no great degree of accuracy is required, says *Popular Mechanics.*

A wire which is three sizes larger than another wire has one-half the resistance, twice the weight for a given length, and twice the area.

A wire which is 10 sizes larger than another wire has one-tenth the resistance, 10 times the weight for a given length, and 10 times the area.

A No. 10 gauge wire is approximately 0.1 inch in diameter—to be exact, .1019 inch, or 101.9 mils; it has an area of approximately 10,000 circular mils—to be exact, 10,380 circular mils; it has a resistance of 1 ohm per 1,000 feet, at 20 degrees C, or 68 degrees F, and it weighs approximately 32 pounds per 1,000 feet—to be exact, 31.43 pounds.

The weight of 1,000 feet of No. 5 wire is approximately 100 pounds—to be exact, 100.2 pounds.

Thus, if it is desired to know the resistance and weight, say, of a No. 4 wire per 1,000 feet, it can be determined with sufficient accuracy for all practical purposes from the foregoing relations as follows: Since a wire three sizes larger than another has one-half the resistance, it follows that a No. 7 wire will have a resistance equal to one-half of a No. 10, and a No. 4 will have one-half the resistance of a No. 7, or one-fourth of a No. 10; hence the resistance of a No. 4 wire will be one-fourth ohm per 1,000 feet, and it will weigh four times 32, or 128 pounds per 1,000 feet.

The procedure in calculating resistance of a wire that differs in number from a No. 10 by an amount that is not a multiple of three is a little different from the above. For example, if the resistance and weight of a No. 8 is desired to be known, proceed as follows: First find the resistance of a No. 20, which is ten times a No. 10, or 10 ohms per 1,000 feet; then find the resistance of a No. 17, No. 14, No. 11 and a No. 8. The resistance of a No. 17 is one-half of a No. 20; of a No. 14, one-fourth of a No. 20; of a No. 11, one-eighth of a No. 20, and of a No. 8, one-sixteenth of a No. 20, or .62 ohm per 1,000 feet. The weight of a No. 8 would be 16 times that of a No. 20, but a No. 20 weighs one-tenth of a No. 10, or 3.2 pounds per 1,000 feet; hence a No. 8 would weigh 16x3.2, or 51 pounds.

If the area in circular mils is known, the approximate number of feet per ohm can be obtained by dropping one cipher.

The approximate weight for a given length may be found by dropping four ciphers from the area in circular mils, and then multiplying by the weight of a No. 10 wire.

The values, as calculated above, are not exact and do not correspond with those given in a wire table, but they are sufficiently accurate for almost all ordinary purposes.

Recognition of Science

In a letter dealing with "Science and the State," Prof. J. A. Fleming, F. R S., England, draws the following interesting picture of what would happen if all iron suddenly became non-magnetic:

Consider, for instance, what we owe to the work of electrical engineers and to the scientific discoveries on which it is based. It has all been built up on a scientific study of the magnetic properties of iron. The scientist did not create those properties, but he discovered and utilized them. The value of his work may best be estimated by supposing them taken away. Just imagine what would happen if by some extraordinary freak of nature the common metal iron lost its power of being magnetized, without otherwise losing its mechanical properties. Suppose we all woke up next Monday morning to discover that such an event had happened in the night. Crowds go as usual to their railway stations, metropolitans, tubes and main lines, only to discover that no electric trains are running. The dynamos at the supply stations have all ceased to act. Officials are frantically endeavoring to find out why the current is cut off, but all telephones and telegraphs are dead. No electric light can be obtained, no electric bells; no taxicabs or motor buses can move because their magnetos for the same reason are perfectly useless. No main line trains can run because all signals are unworkable. No anarchist in his wildest dreams could imagine a more complete knockout blow dealt to our civilization than would thus be effected. Darkness, starvation and unemployment would in one month reign in all great cities and all shipping would be sealed up in port or lost on the high seas because the compasses had ceased to direct. Factories would be idle and electric power supply cut off at the source. Business would be arrested. Then just suppose that, after a month of this holdup, infinitely worse than any war, electrical engineers discovered a way of restoring to every piece of iron and steel its magnetizable properties. Hey, presto! all this frightful calamity and disaster would begin to roll away. Wheels would once more begin to turn, lights to come in, telegraphs and telephones to speak, motor vehicles to run and dying population to be fed, lighted, warmed and set to work. All this, however, is the work of the electrical engineer and scientific discoverer. He it is who has provided the basis on which our present artificial urban civilization rests, and without his work it all comes down with a crash into the dust. It is the scientific discoverer and inventor, the engineer, civil, mechanical and electrical, who is the upbuilder and instigator. He is, however, the very last person to receive encouragement and honor. Politicians vote themselves immense salaries and rewards for insignificant work, but they dole out assistance to the scientific worker with a niggard hand. Inventors may in one sense be left to take care of themselves and under the ægis of patent laws. It is the pure scientific investigator who needs special encouragement.

Using Hand Microphones in Lorain

"Hand" telephones have just been placed in stock by the Black River Telephone Company of Lorain, Ohio. Patrons can have them installed in their homes for a quarter more per month than is paid for the ordinary desk telephone extension. With the little black box from which the telephone hangs on a hook, the "hand" telephone can be installed on the wall of a bedroom, in the kitchen or sewing-room, or any other convenient place.

Physicians find the new telephone convenient for night calls. It can be hung close to the bed and can be lifted from its hook with one hand.

Growing Poles Baffle East African Ants

On an East African telegraph line living trees are used to support the wires in order to escape the destructive ravages of the white ants, which attack the poles but not the trees. The latter are planted along the line with their branches cut off. They readily take root and need only to have their branches trimmed from time to time. The wires are affixed by means of tarred cords of hemp in place of insulators. Eventually the trees will be replaced with iron poles, which will be equally unattractive to the insects.

The Telephone in the Garage

Its Importance to the Business, from Garage Efficiency

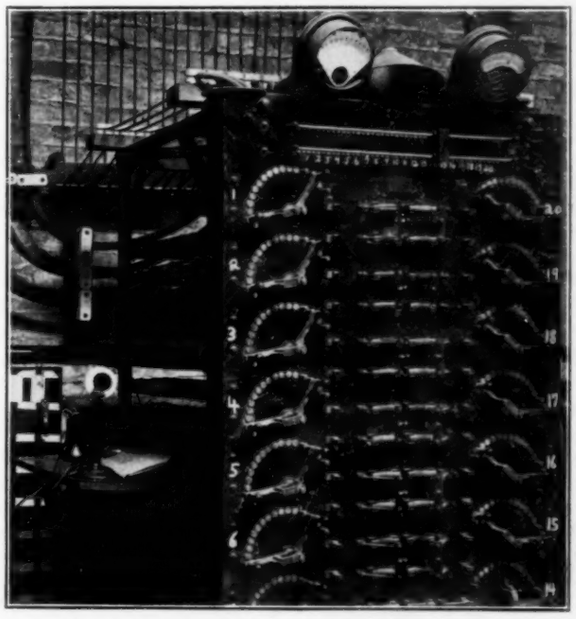
THE telephone has taken an important part in the development of the garage industry. Since the establishment of the first garage it has been as essential part of garage equipment. Today more than ever, the telephone is one of the principal factors for efficiency in garage service.

"Without the telephone," remarked the owner of a large Chicago garage recently, "we might just as well shut up the shop. To run a garage without a telephone would be like trying to guide a car without steering apparatus. The housing of cars is but a small part of service. I transact most of the business over the telephone. The secret of garage efficiency is prompt and careful attention to telephone orders. Some of my customers have never been inside these doors but they know my telephone number stands for service, and they get it. My telephone is a live business asset."

Briefly the garage owner summed up the relation or the telephone to garage efficiency. It is the door through which the biggest and best part of the garage owner's business enters. And the garage owner who makes it a point to attend to his telephone orders with despatch and care has learned one of the secrets of giving efficient garage service.

The uses of the telephone in the garage business are countless. It facilitates every kind of garage service. Every automobile owner, with but rare exceptions, has a telephone. When he wants his car delivered to his home or place of business, his first thought is the telephone. And he expects it to be there at the time designated. When he wants his car "shined up" he telephones. Perhaps he remembers that his lights appeared dim the night before, and he calls up his garage man to tell him. Many times daily orders come in such as: "Put a new bulb in my right headlight." "Be sure my tires are hard before the car goes out." "Better examine my spark plugs," etc.

The Telephone is the Open Door to the Garage. Promptness and Courtesy Make a Good Impression Here.



Plenty of Telephones Means Quick Service to Patrons.

Requests for new tires, batteries, tape, oil, for all kinds of auto supplies, both common and uncommon, come over the telephone. If the garage doesn't have in stock the particular thing wanted, the garage man steps to the telephone and orders it. He buys and sells a large part of his supplies by telephone.

Unexpected things are always happening. Every garage man gets calls to go out and tow in disabled cars. One garage owner remarked that a day never passed that he does not get at least one such call. No matter how far away the driver of the disabled car may be, his first impulse is to find the nearest telephone.

Women who own and drive cars are very liberal users of the telephones. One Chicago garage which makes a specialty of caring for electric cars, of which most of the owners and drivers are women, has found it necessary to install several telephones. To have enough telephones so that any customer can reach the garage promptly by telephone at all times is an important part of the service.

This service is satisfactory because it produces results, quickly and with the least effort. Garages, especially those catering to the care of electrics, advertise their services as being conducted reliably by telephone communication. The present system has been tried out and has proven so satisfactory, that the car owner is guaranteed delivery service within thirty minutes after the order has been telephoned to the garage.

European Telephone Development

Translations from the Foreign Press and Communications from European Engineers

BY FRED W. SCHOLZ

A VERY interesting article by a Berlin telephone engineer, R. Hartz, appeared in *Telegraphen und Fernsprech-Technik* on the plans for a telephone exchange, especially the service, preliminary equipment, etc.

In order to plan an exchange properly, telephone engineers make use of a chart or a plan, which shows how many exchanges a city will have after 15 years of service. In addition the chart shows the number of subscribers' lines in each district and each exchange; it shows the network of underground conduits, the local and long distance lines in each district; in short, it gives a complete picture of the details that are needed to study an exchange. The time of 15 years has been chosen, as that is about the age of the equipment, and as it may be that after that period the equipment will have to be renewed in accordance with the most modern inventions. The process which will be described later tries to find the lowest current expense with which the equipment can be operated in the different exchanges, as also the most economical way of laying cables, lines, etc. The most important reason for the chart is therefore on the side of management and economy. The chart shows also where the center of a district is, from which spot the greatest number of subscribers can be reached with the minimum length of wires. Having the conduit lines as also the openings in these cable conduits, it is easy to plan extensions of these lines so as to be of the least expense. In a similar manner the plans will protect the company from ordering too great or too small an equipment, avoiding trouble and difficulty either way. Such a chart will serve chiefly as a guide for later development. When the time has come to expand the exchange equipment the plans will aid in finding out exactly what and where the improvements are to be made. Of course it is taken for granted that the actual expansion of the districts will always be kept posted on the chart or charts. If the development of telephone subscribers has been very irregular due to some reason or other, it would pay to set up a new chart after three years. Under other conditions these new charts need be drawn only after five years' time. These plans are of greatest value to cities where there are numerous exchanges. Where the number of subscribers does not exceed 10,000 within the ultimate period, one district will be sufficient and all the work will probably be carried on from one exchange. In the main the only question to be answered in such a case is the correct center of the network of telephone lines. More difficult is this question when the 10,000 mark is passed and new exchanges must be established.

The process of inquiry is briefly the following: Investigations are made to see to what extent the population to be expected after 15 years will use the telephone, how the telephone lines and telephone stations will be distributed over the city. For this ultimate figure the most economical and advantageous exchange plan is worked out, starting from the assumption that there is theoretically no exchange at present. This ideal plan is now adapted to the practical equipment on hand. On the side of the underground cable work the ideal theoretical plans are worked out and then these plans are adapted and correlated as far as possible with the cable conduits in existence. In going about planning the exchange the first question is to find out the probable number of telephones and lines needed for the ultimate population and the distribution of the same. First of all we determine how many telephones and lines the *present* population will have at the end of the 15 years' time, and from that figure deductions are made as to the extent to which the *final* population after 15 years will use the telephones. For this purpose it will be well to subdivide the telephones into various classes and to determine the equipment for each class. In Berlin, for example, they divide the telephones into those paying special annual bulk rates, and those paying the regular subscribers' call rates. On the technical side we differentiate between private lines and party lines, having three or five parties on a line. Aside from the merely technical side differentiation ought to be made on the use to which the telephone is to be put, whether for business or for private purposes. The business telephones again are subdivided into those for banks, officials, hotels, and other business firms. The classes should be chosen in such a way that aside from the general division into commerce and industry, the division shows plainly the more important industries that have their homes in the city in question. By the aid of these divisions it is easy to follow out the frequency with which certain lines of business or trade use the telephone and to employ these statistics not only to follow up the development of the various industries and the relative increase of the telephone with them, but also possible publicity campaigns which might be undertaken to introduce the telephone in industries which are shown to be stationary in this line, or else are behind the records of kindred industries.

In investigating the final demand of the present population, it will be necessary to find out: (*a*) what business concerns and private houses are at present connected by telephone and how these connections will change or increase to the final time limit, and (b) what private persons and what business firm will probably add telephone connections at the end of the 15-year limit. Under *a* there will be found that the changes in the present number will appear in the change from flat rates to bulk rates, or that party lines become private lines. Under *b* it will be found that certain business lines which do not use the telephone at present will have the same installed. For *a* and *b* we will have the following points: The increase in the use of the telephone will depend on the degree of saturation reached by the town, city or district at the present time. Places where the telephone is not as well developed may expect a greater development than those where the telephone is used quite frequently. These matters will of course depend also on the liveness of the town, the amount of industry and business in general. There are also peculiarities of the subscribers that have to be studied.

In smaller towns it may be found that most subscribers favor the flat rate contract, and it will be necessary to find out what the probability is that this condition will hold true later. While the investigation for business concerns is more or less guesswork, this is not the case with private parties. The chances are that the telephone will have such importance for the private party of a certain income that these people will not want to get along without them. It may be taken for granted that persons with a minimum income can be counted as future telephone subscribers. This amount could be related to the rent paid, since it is easier to do that than to find out the incomes of the persons involved. The rents paid are about equal to from 15 to 20 per cent of the income. If it is to be expected that at the final time limit about 7.5 per cent of the rent will e at disposal for telephone rates, it is easy to figure out from the rents as also from the telephone rates at that time what houses and districts will proably have telephone service. If, for example, telephone rates for private lines

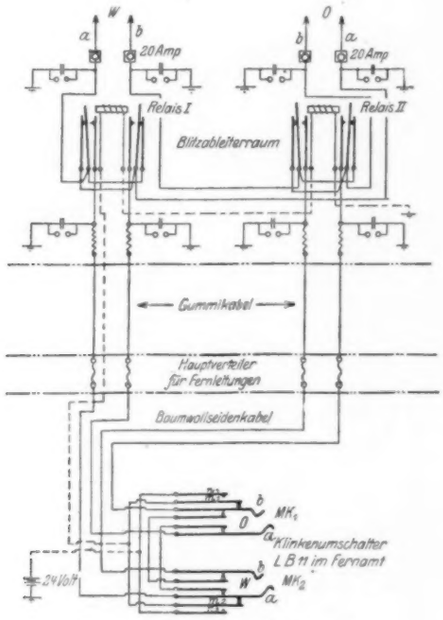


Fig. 1. Relay Wiring for Testing.

were $20 a year, this would correspond to a rent of $275, and all apartments with that rental could be estimated to have telephones at the final time limit. In this way the rooms of higher rental and the higher incomes can also be determined.

In making the canvass best results can be obtained by investigating the possibilities of connections in every house within a certain district. The city is subdivided into numerous districts, business, private residences, factories, etc., and each district again into squares. For each square there are used two formulas, one for business, one for private telephones. The possible introduction of telephone pay stations is also to be noted down. Empty lots within the districts must also be noted. Rents can be obtained either from agents or owners. The rental value of the apartment houses should be obtained from the building department, in order to get the right figures. By finally adding the various sheets it is possible to find the final number of telephones at the end of the 15 years. The results in question will then be entered on a map of the city which has been subdivided into the corresponding squares and districts. The map with the present blocks of houses shows now what the final number of telephones will be with the present population. The next step is to find out how great the eventual population will be and how the city will be built up.

In estimating the probable population, the population statistics of the past 20 or 25 years should be consulted, and diagrams drawn from them to show the probable development within the next 15 years. Here the consideration must be taken whether the city is a center of certain industries, of railroads, or other developments which will assure it certain sudden rise, or whether this rise will be slow and small. The development of city limits by annexing suburbs, the developing of new transportation lines, bringing the town nearer to other centers, must also be considered. The final figures obtained should be verified and checked by the municipal bureau, or by some experts who are experienced in this kind of work. When it is known what the final population will be, the telephone engineers should again get into communication with the city building department and confer with the officials to find out how the city will probably expand, what the future plans are, and in what direction the greatest growth is expected. In districts devoted to the building of living houses and apartments, the possible status of the rents should be ascertained. Of great importance is the question of development of certain business centers at certain districts, whether they be new, or whether they be only expansion of those already there. The area for these business houses will not grow in the same ratio with the population, as the real estate will increase in value and the buildings will be higher and the area will be less. The portions of the city that are still to be built on should be marked on the city map in dotted lines. The business district of the present and that of the future should be marked in dotted red and green lines. What area the business center will finally cover could easily be determined by taking the experience of similar cities of the same opportunities, that are further developed, however.

In obtaining the final number of subscribers' telephones and lines we may assume that the final population will use the telephone in about the same ratio as is the case of the present population at the final time limit. By using the ratios in question it will be easy to estimate that final number of connections. If, for example, the house to house canvass has shown that the present population of 500,000 will eventually have 35,000 telephones with 10,000 flat and about 10,000 bulk rates, we may figure, counting on the end population of 800,000 inhabitants, on 56,000 subscribers with 16,000 flat and 16,000 bulk rates. Chart I will show where the 35,000 telephones with their lines will lie, while the unbuilt lots and areas will show where the probable 21,000 telephones of the future will be. The latter will be shown on map II, and the telephones can be distributed, so that the quarters nearer to the present city limits will have the greater number of telephones, and those further away will be more sparsely supplied. If now the telephone department has the position of the lines, the next question is to see how much these telephones will be used, so that the equipment at the exchange may be

properly laid out. In general the kind of rate will give a good indicator for this factor. Thus it has been found that under German conditions flat rates may expect 3.5 to 5 calls per day, while bulk rates may expect 18 to 35 calls. These figures vary of course with the time, the season, the detailed circumstances. The details are to be obtained through careful study.

Detailed Suggestions for Charts—Before it is possible to go over to the theoretical estimate of the best technical equipment, the telephone engineer will require some helpful details. The first of these will be a city plan. This map should be a topographic map showing streets, railway lines, waterways, river, and otehr kindred matters. The widening of streets to be expected from city plans ought to be marked in dotted lines. The best plan is to make one plan from which as many blueprints can be made as desired. The best scale will be 1:5000. With larger cities it is advisable to divide the city into districts and devote one map to each dstrict.

There should be a plan *A*, based on the above map, in which the conduits and cable lines, the cable terminals and junction points, and cable manholes are marked. Those that are already in use should be marked in red ink, those that are contemplated for the next year or two in green ink. The conduit line might be a full line, designated by $\frac{a\ (b)}{c}$, where *a* is the number of openings, *b* the number of unused openings, and *c* the number of lines in each opening. The underground cable line should be a broken line, designated by $\frac{a}{c}$, where *a* is the number of cables, and *c* the number of double conductors. Cable branches should be marked by rectangles, marked $\frac{a}{s}$, where *a* is the total capacity for cables and lines, and *s* is the side towards the subscribers, while *a* marks the side towards the exchange. The final branching off of the cables and leading towards the exchanges should be marked by a circle, marked *a*, which shows the number of double conductors. In addition, the more heavily loaded overhead telephone lines must be marked with dotted lines, showing also the number of double lines. All the smaller overhead lines which only distribute the telephone wires to the small subscribers, as also the long distance lines are to be left out of the chart. A map *B* should show all the streets, bridges and places that cannot be used for conduits, and these ought to be marked by red crosses. Possible places where rocky soil or other reasons would make the laying of conduits very expensive are also to be marked. Reports on the various pavements, the probabilities of changes, the streets where conduits can be laid under the sidewalk, in fact, all points that would aid in estimating costs should have their places in this plan. There should also be a report showing the technical equipment of the exchange units in use, having the A and B-operators' places, the switchboards with details, and finally the type and age of equipment. Finally there should be a plan *C*, which shows all the buildings used by the telephone company, marking telephone company's owned building in green, the rented buildings in red. This chart should show the size of the ground and the value, as also the area of the space rented, the rental, time of lease, value of real estate in the district where the floor or building is rented. The buildings owned by the company ought to have maps of their various floor area, giving height of the room, permissible load per square foot, use of space at present. Notes ought to show also whether the buildings can be expanded by lengthening, broadening, building higher, or other means. Special matters as to fire danger of nearby buildings, details as to air and space should be noted.

In order to do all this work it is best to subdivide the city at once into the exchange districts, that are to be the permanent districts. When using the common battery system, each exchange would have about 9,500 subscribers' lines, and by dividing the total lines by 9,500 we find the number of exchanges, and therefore the numbers of districts. In most cases it will be advisable to use a larger number of units than is indicated by the division. Thus, if 34,000 lines are estimated after 15 years, the division would give at least 4 units. But as these four units would each have at least 8,500 lines, it will be better to figure on 5, 6 or 7. The number of official districts will also depend on the question whether more than one unit district is to be served from one exchange. As a rule it is better not to have more than two units at each exchange. After the number of districts have been determined, the next question is the limits of these districts. As the limits at present are only theoretical, the streets in question need not be used as boundaries, and it will be better to use natural boundaries as railway lines, a river, water supply system, or similar means for this end. As a rule one district with two units will embrace the business center, and the others will be arranged similarly. After the size of the district is determined, the position of the exchange must be found. For this a point must be found where the length of all the telephone lines has a minimum value. This point

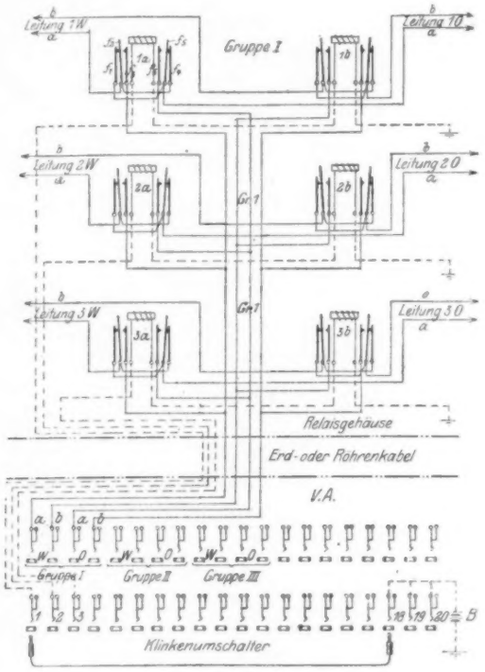


Fig. 2. Relay Wiring for Testing.

is found by first finding the main thoroughfare axis through the district, from which axis there runs the same number of telephone wires to either side. If another axis, at right angles to the first one, is moved up and down, until the number of lines on either side of that axis is also alike we have the position of the exchange at the intersection of the two axes.

The Annual Costs—A large percentage of the costs, as for cables, exchange equipment and technical installations appear only once. As the life of the different details varies, however, it is difficult to see from the mere expense account which plan will be the best. We must add to this that another important item, the salaries of the operators and the management, can only be considered under running expenses. In order to obtain a valid comparison, it will be advisable to express the original costs also in annual terms, by changing them to the forms of annual depreciation, interest, sinking fund, etc. The annual operating cost can be added to the figures at once. As the annual costs are to be used for purposes of comparison and not as basis for later expenses, all costs that will remain the same for any type of service can be left out. Thus the expenses for the subscribers' instruments and the interior wiring can be omitted. The expenses can be roughly divided into annual costs for subscribers' lines; for trunk lines; for A- and B-places; for multiple fields of exchange units; for other technical equipment; for the exchange equipment in general; for the exchange operating force and management.

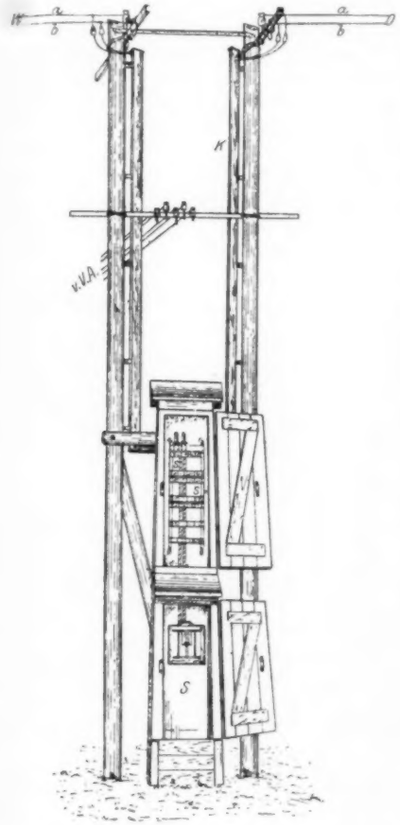


Fig. 3. Wooden Relay Poles.

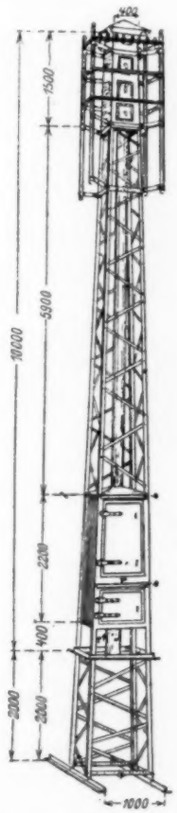


Fig. 3a. Girder Relay Pole.

The annual costs for subscribers' lines are composed of interest, depreciation, and maintenance of the lines. In figuring the depreciation, the scrap value of the telephones less the costs for removal must be considered. Of interest is also the actual utilization of the lines, which as a rule will not exceed 80 per cent, and will be less in districts with smaller number of wires. Finally the costs are influenced by the size of the cables used, whether 400, 500 or 600 pair. The costs will then have to be reduced to the cost per km. (mile) wire, depending on the strength of the conductors. The annual costs will vary depending on the length of wires of varying strength. It may then be possible to establish certain units and to figure on units of say 3 km. of 0.8 mm. conductors, which will cost so much per km., etc. The numbers of km. wire for one district are easily determined and the total cost is only a matter of figures.

For determining the costs of the inter-office trunk wires the formula $v = c \frac{a \cdot b}{N}$ is used, where v = the number of daily connections between exchanges A and B, a and b = the number of daily calls in A and B. N = the number of all the calls in the local telephone system, c = a constant number. The constant would have the value 1, if every subscriber in the local telephone district were to speak the same number of times with all the other subscribers in the district. But as the subscribers in a certain district talk less with those in another district, and more with those in their own district, this constant is usually near 0.75. The greater the distance between the districts the smaller is the constant. The outgoing and incoming traffic of the districts is usually equal, although business districts usually have more incoming than outgoing calls. The value of a and b depends on the number of flat rate and bulk rate telephones. After the value v has been obtained, it is necessary to correct this to the busiest hour of service, whose portion of the total daily service varies between 1/7 and 1/10. Here also special investigations may have to be made to obtain the final figures. The final cost is figured similarly to the previous method.

In figuring the annual costs for the A-operators' switchboards we have first of all those for the multiple switchboards, without the call lamps and the answering keys, since these are the same for all systems. The switchboard itself, the cord equipment, and the use of plugs and cords, must be figured. In the B-switchboards we have the same figures and instead of the pairs of cords, the relay equipment for the incoming trunk calls. As the number of cords varies with the different B-switchboards, it is advisable to put down the relay costs separately, depending on the number of incoming trunk lines. The annual cost (a) will therefore be higher for the A-operators than the cost (b) for the B-boards. If we place the relay costs of B equal to c, we have the total costs equal to $A.a+B.b+V.c$, where A, B, V are the numbers of wires for the A- and B-boards and for the incoming trunk lines. A and B can be determined from the figures in the hands of the engineers. How many calls are received and answered at one A-board depends on the percentage of the outgoing traffic. This can be obtained from the total of the calls and the outgoing connections. As soon as this passes 60 per cent it is advisable to have the local calls go entirely over the B-boards. In this case we would have to count on

the A-boards with 100 per cent outgoing traffic. If the percentage is fixed, the number of calls per A-operator for the rush hours can be determined from a curve that has been worked out by a German engineer, and by dividing the total calls by the switchboard wires we have the number of A-operators. The B-operators can be determined similarly. The efficiency per board operator increases, the more operators there are in any one exchange unit, for the calls coming to one and the same exchange; the maximum value being for four operators' switchboards. Above this figure the efficiency remains the same. Finally we come to the costs for the general technical equipment, the exchanges and the operating force. There are hardly any new points that can be brought in here, as the equipment is about the same everywhere. In the case of the operating force, consideration must be taken of possible auxiliary operators in case some of the regular staff are taken sick or leave for some reason. For the estimate after 15 years' time limits allowances must be made aside from the increased number of operators for increases in wages. The repair men, and the general operating force, not including the telephone operators themselves, need not be discussed further.

The only point that remains is the adaptation of the theoretically most satisfactory type of service and plans to the present equipment. It need not be emphasized that in all cases the present equipment should be used as much as possible, provided the equipment is still within the limits of usefulness. Under this consideration it may happen that another district plan than that one which is the most economical must be used, as it is easier adaptable to the present system. In determining the question whether under otherwise favorable conditions a larger or smaller number of districts is preferable, the choice should go to the larger number, as the power of expansion is much greater and more flexible. More districts means also less telephone conductor material, although this saving is again offset by the increased salaries to the operators in the greater number of exchanges. From the standpoint of fire risk also the case is decidedly in favor of a greater number of districts, as the service could not be crippled as completely as would be the case where there are fewer districts and consequently more wires to the few exchanges. After all the work of planning has been accomplished it might be well to work out a sort of resumé, showing when probably the exchanges will have to be equipped, when the ones in operation have to be remodeled, and how the number of subscribers of the different exchanges agrees with the efficiency of the various exchanges.

ELEKTROMAGNETIC TESTING IN TELEPHONE LINES.

In *Zeitschrift für Schwachstromtechnik* is an article on the above subject, which offers some points of interest. With the expansion of overhead telephone lines it has become more and more difficult to use very heavy wires for that purposes, especially in thickly populated districts. Attempts have been made to remedy this trouble by either using wires of a different type and thinner or by using cables. The only drawback to this scheme was that communication over long distances was harmed and the efficiency of the telephone decreased. Since years, however, it has been found expedient to use the very heavy wire throughout an entire line and to avoid places where this is inexpedient, which means, in most instances, large cities. Here a great detour has to be made, which is quite expensive but necessary. The disadvantage is in the fact that testing of lines can only take place at great intervals from the local exchanges, as the distances are too great for more frequent tests. Consequently troubles grow on the lines and are not checked until they have reached serious proportions. This has called up the idea to build in testing stations into these long distance lines, which can be controlled electromagnetically from the local or the nearest exchange, in such a way that the line to be tested can be connected temporarily to the exchange, and then treated just like any other permanent line.

In selecting the place for the testing station, the question whether the connection with the exchange will be entirely or only partially underground is of some influence. In the first instance a place is selected where the telephone pole can be used naturally to bring the cable to the surface and connect to the overhead line. If the connection is to a telephone cross arm on top of a house, the switches and safety fuses can be placed in the garret and there is needed only a simple protective box. In the second case a special wooden double pole with weatherproof iron case must be erected or else a steel girder pole. Entirely overground wiring for the testing station can only be used if the number of wires needed does not pass beyond a moderate number, say 24, if there are no cables on hand that could be used, or if it is uneconomical to lay underground cables. In general, however, it will be sufficient to have one double loop for every four telephone lines in exchanges of medium size. As every telephone line requires a double relay with connections, we need for four telephone lines with one double loop eight conductors. The relay wiring for separate testing lines is shown in Fig. 1, that for common testing purposes in Fig. 2.

In these cases every branch of the telephone line is connected when at rest to the testing poles, two parallel contact connections always being within the current path, so that there is a good permanent connection. The current sent from the exchange and used for connecting the lines to the exchange must be at least 10 milliamperes, flows through the first and then the second coils, and makes the middle relay springs connect with the working contacts. Through this the telephone line branches are disconnected and connected to the exchange testing line.

If the garret of a building is used for the testing station the relays and fuses can be placed in an ordinary sheet iron casing with long and cross steel sections, with a door, the entire case being fastened to the wall or else suspended freely between two pipe stands. If the wooden poles are used, a weatherproof case of the type shown in Fig. 3 must be used.

If the wooden poles cannot be used the steel girder poles must be employed. Of importance is the construction of good grounding, and of lightning arresters of low resistance, first so that the relays shall function without trouble; second, because the very small atmospheric discharges, which are not conducted to earth by the vacuum lightning conductors on account of the excessive resistance of the ground connection, may be still strong enough to cause contact between the relay springs, since the discharges would reach the relay spring sets and melt the contacts.

The Telephone Scrap Book

Curious and Useful Items, More or Less Telephonic, Gathered from Everywhere

Reflection in Submarine Cables

THE recent laying by the British Columbia Telephone Company of a submarine telephone cable between Point Grey and Nanaimo together with the land connections, makes possible the establishing of a continuous telephone circuit from Vancouver via Nanaimo, Victoria and Bellingham (Wash.), back to Vancouver. This circuit passes through the two principal submarine cables owned by the company and makes an excellent circuit on which to study the effects of reflection at the cable ends, says L. P. Crim in *Canadian Electrical News*.

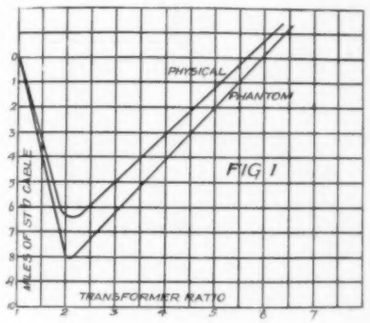


Fig. 1.

The cable between Bellingham and Victoria is of the 4-core gutta percha insulated type for use in deep water. The copper conductors weigh 180 pounds each per naut. and are each insulated with 180 pounds of g. p. per naut. There are about 14.7 nauts. of this cable in five pieces varying in length from 0.25 to 8.0 nauts. The Point Grey-Nanaimo cable is of the continuously loaded type and has stranded copper conductors weighing .300 pounds per naut. which are each insulated with 300 pounds of g. p. per naut.

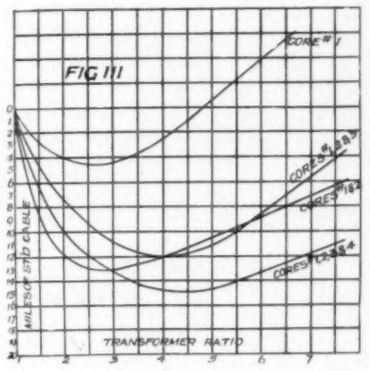


Fig. 2.

It was found that the reflection losses in the physical circuits of the Bellingham-Victoria cable amounted to about 6 miles of standard cable, while in the phantom circuit, the losses were about nine miles of standard cable. The heavy transmission losses in the phantom circuit have prevented its use prior to this investigation.

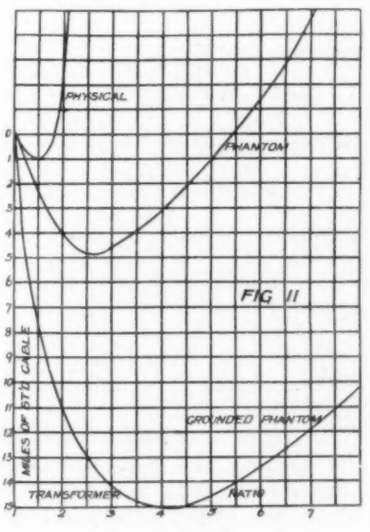


Fig. 3.

In the new Point Grey-Nanaimo cable it was found that reflection losses in the two physical circuits were equal to about 3 miles of standard cable per circuit, with about 5 miles loss in the phantom. It is proposed to work a fourth circuit through cable by means of a grounded phantom on the metallic phantom. Investigation has shown more than 15 miles of standard cable reflection loss in this circuit. This possesses some rather unusual qualities for a telephone circuit. Its loop resistance (total) is about 32 ohms (including terminal transformers), total capacity about 39.6 microfarads, the total inductance about 39.2 millihenrys, with a total leakance of about $11.20/10^4$ mhos.

Much has been written by the theoretical investigators concerning reflections of waves in passing from one portion of a circuit to another of different surge impedance, but there seems to be little or no published record of experimental research in this direction. The surge impedance for a telephone circuit may be likened to the diameter of a long speaking tube. If the diameter of a long speaking tube increases suddenly and continues at the larger size for say 200 feet and then is suddenly reduced to a comparatively small diameter again for the rest of its length, it cn readily be understood that sound waves passing through the tube will be partially reflected at the square ends where the tub changes size. If these partial reflections exist to any great extent the speaking qualities of such a tube will not be good. The surge impedance of a telephone circuit is the proportionality factor between voltage and current of the traveling electric waves. As these waves constitute a certain definite quantity of energy, its amount cannot change except by attenuation. Therefore, if the surge impedance of the circuit changes, the proportionality factor between the current and voltage also changes, which is to say that there is a transformation of current and voltage at every point in a circuit where the surge impedance changes. This change in voltage and current sends a reflected wave in the opposite direction to that of the initial wave, the size of which depends upon the sending end impedance of the circuit in either direction from the point of reflection. If these reflected waves are attenuated until they become of negligible size before reaching the receiving end of the circuit, the energy thus reflected becomes lost. As the phenomena of reflection is caused by the transformation of current and voltage due to the change in surge impedance, it is quite logical to assume that this effect may best be overcome by inserting in the line at the junction point a transformer of the proper ratio of transformation. The investigation was therefore conducted along these lines and the attached curves show some of the experimental results obtained.

Fig. 1 shows the variation of transmission equivalent obtained by using transformers of various ratios at the ends of the Bellingham-Victoria cable. Curves are shown for the physical and phantom circuits.

Fig. 2 shows a similar set of curves for the Point Grey-Nanaimo cable, for the physcal, metallic phantom, and grounded phantom circuit.

Fig. 3 shows a set of four curves obtained from the

Point Grey-Nanaimo submarine cable, using respectively one, two, three and four cable cores in multiple as one conductor with ground return. The reason for the seeming inconsistency of the curve obtained from cores 1 and 2, with respect to the other three, is not apparent.

After obtaining experimentally the ratio of transformation that would give the best transmission in each case, a set of transformers was made and installed at the cable ends. It was found that experimental results checked theoretical calculations as to the transformer ratio required, with a fair degree of approximation.

(Note.—The standard cable referred to has the following properties: $R = 88$ ohms per mile loop, $C = .054$ mf., $L = .001$ henrys, $S = 5/10^6$ mhos.).

Anglo-Continental Telephones

THE traffc between England and Ireland and the Continent grows continually in volume, resulting in the need of additional means of communicaton. The post office engineers are making experiments with the object of obtaining a greater output from the telegraph and telephone submarine cables connecting England with Ireland and the Continent. The following, says *Electrical Review*, London, is a brief outline of the methods adopted in the tests:

Disturbances in submarine telegraph cables, due to stray currents, etc., have been one of the chief difficulties in connection with successful cable telegraphy. This disturbance is very much more marked when the submarine cable contains more than one circuit, because every pulsation of current in one circuit generates a current in each of the neighboring circuits, with the result that the sensitivity of the receiving apparatus has to be reduced sufficiently to avoid the effects of these induced currents.

Speaking generally, this reduction in sensitivity reduces the working speed to about half of what it should be. With the view to avoid this reduction of speed in working, experiments are being made with metallic circuit working and superposed circuits as indicated in the diagram Fig. 1.

This represents a four-wire cable, and shows how four circuits entirely free from inductive disturbance from each other can be obtained:

Circuits 1 and 2 work on ordinary metallic loops.
Circuit 3 is superposed on circuits 1 and 2.
Circuit 4 is superposed on circuit 3.

There are thus three loop circuits and one earthed circuit; the latter, although the equivalent of a single-wire circuit; is not subject to any inductive disturbance from the other three.

It is well known that a loaded cable can be constructed either on the coil or continuously loaded principle, to give three independent double-wire telephone

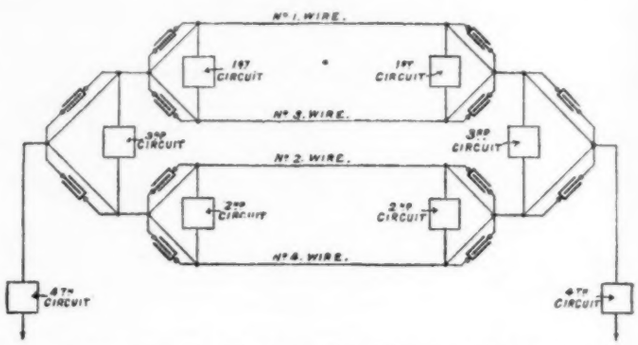


Fig. 1.—Arrangement by Which a 4-Wire Submarine Telegraph Cable Can Provide Four Circuits Free from Inductive Disturbance.

channels in a four-wire cable. The interesting point about the present experiments, however, is the extension of the principle so as to obtain a fourth independent loaded circuit in such a cable. The diagram Fig. 2 shows two ways of achieving this object.

The diagram represents a four-wire coil-loaded telephone cable. Circuits AA_1, BB_1 and CC_1 are worked on the usual phantom scheme, and are all loaded in the regular manner. Circuit DD_1 is obtained by working in parallel through all the four wires. If the phantom coil combination at each loading point consists of two separate loading coils (one coil in each pair of wires and two windings on each coil), then all the windings in circuit DD_1 will be inductive as well as in AA_1, BB_1 and CC_1, and therefore the four circuits will be loaded. The scheme also applies to a continuously loaded cable. As an alternative to tapping off the earth circuit at *4*, the arrangement shown in dotted lines may be adopted for this circuit, E and E_1, being inductive impedances in series from *1* to *2*, but noninductive in parallel from point *3*.

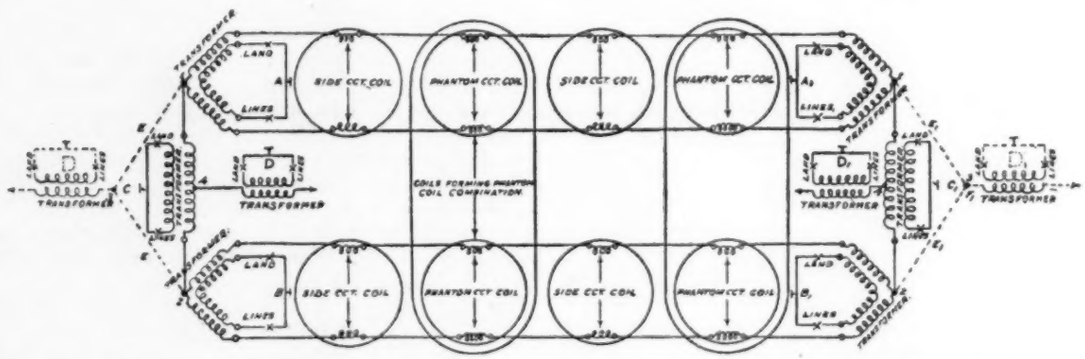


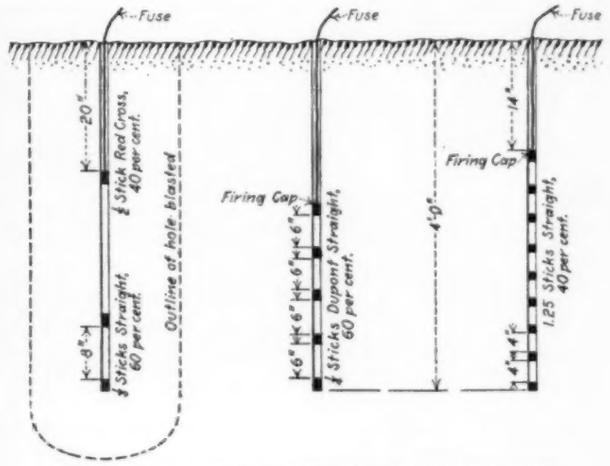
Fig. 2.—Scheme for Working Four Loaded Submarine Cable Circuits in a 4-Wire Cable from Two Pairs of Wires.

If this latter method be adopted, transformers in circuit C may theoretically be dispensed with, but there has been found to be an advantage in retaining them for practical reasons.

Experiments on a coil-loaded cable between England and Ireland and a continuously-loaded cable between England and France have given excellent results, and telephone circuits are now working on this system between the countries named.

Digging Pole Holes With Dynamite

MORE light on the subject of digging pole holes with dynamite is given by the *Electrical World*. Assuming that a pole hole 4.5 feet deep with an average diameter of 16 inches is to be opened, a vertical hole about 2.25 inches in diameter to receive the explosive is first bored to the required depth. A good tool to use is a hollow crown drill having a cutting head 1.75 inches in diameter and a cross-bar 2.25 inches thick.



Arrangement of Dynamite Charges for Blasting Pole Holes.

With such a tool one man can drill a 4-foot hole in five minutes. Good results may also be obtained by driving a 4-foot punch bar into the earth, meanwhile striking it transversely at intervals to facilitate withdrawal. To prevent earth from falling into the hole after the charge is placed, a cylindrical paper cartridge should be fitted loosely into the drill hole. Before inserting this tube in the hole, however, the dynamite stick should be subdivided and the pieces distributed in the tube by means of a graduated stick, as shown in the accompanying diagrams. Pins may be pushed through the tube into the dynamite to maintain the spacing after the cartridge is inserted in the hole. The exploding cap should be placed in the top stick and the fuse allowed to protrude about 2 inches or 3 inches from the top of the hole, which should be left untamped. If these directions are carried out, according to one of the large powder manufacturers, there will be no general upheaval of earth when the dynamite explodes, and the operator may stand within 2 feet or 3 feet of the hole. After the blast very little loose earth is left in the hole, and that remaining may be removed with an ordinary post-hole digger in from five to ten minutes. The cost of opening the earth averages from 25 cents to 30 cents per hole, as compared with 50 cents when dug by hand. The number of holes which a given crew of men can blast in a day is also considerably larger. By properly supervising the work two diggers, one flagman, one hole trimmer and one fuse setter can open from thirty to fifty holes a day.

New Apparatus for Distance Writing

A VERY ingenious apparatus has just been introduced from Germany, which is designed to transmit writing, drawing, and the like over a telephone or telegraph line to an instrument which makes a perfect reproduction of the original, says the *Scientific American*. Telautographs have long been in use, but this apparatus differs from others in many important particulars. The writing at the receiving end is done by a pencil of light which travels over a sensitized sheet of paper. The message is thus photographically reproduced, the sensitized paper being developed automatically, in the machine, in a few seconds' time.

The scheme of the device is shown diagrammatically in Fig. 1. At the left is the transmitting station; the receiving station at the right. The position of a point is determined by noting the length of its abscissa and of its ordinate, in relation to two axes, or, to borrow a geographical simile, by noting its latitude and longitude. It is therefore merely necessary to transmit the latitude and longitude to the receiving station in order to locate the same point on a sheet of paper at that place. Accordingly, the pencil P is provided with means for controlling two variable resistances R^1 and R^2, respectively. These, in turn, control delicate galvanometers G^1 and G^2, respectively, at the receiving station, each fitted with a tiny mirror. As more or less resistance is thrown into the circuit at R^1 the mirror B of galvanometer G^1 is more or less deflected, and a beam of light from the lamp A, playing upon this mirror, has its reflection correspondingly deflected. The reflected beam is cast upon the mirror C, which is mounted to turn on an axis at right angles to that of mirror B. Mirror C is deflected by variations in the resistance introduced at R^2, further modifying the direction of the beam reflected therefrom. In other words, one of the mirrors determines the latitude of the point of light that falls upon the sensitized paper D, while the other controls its longitude. Accordingly, as the pencil is moved over the paper at the transmitting station, the pencil of light at the receiving station must reproduce the same line, point for point, on the sensitized paper.

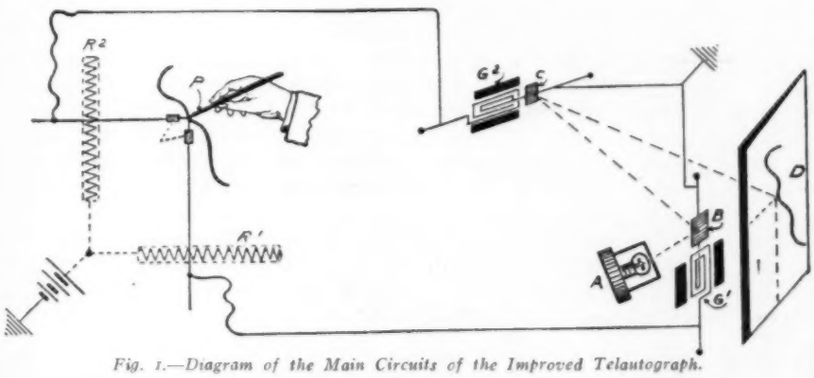


Fig. 1.—Diagram of the Main Circuits of the Improved Telautograph.

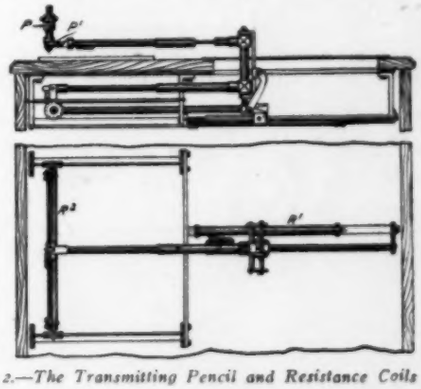


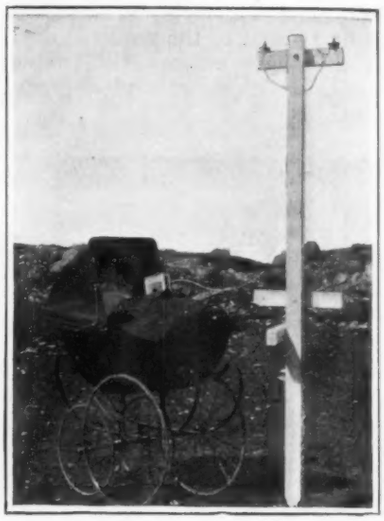
Fig. 2.—The Transmitting Pencil and Resistance Coils

In the photograph of the receiving apparatus, the place where the lamp is introduced is indicated by the letter A. The light from the lamp passes through a series of lenses and reflectors to the small mirror *B*, then to the mirror *C*, finally falling upon the sensitized paper at *D*. The developing tank is shown at *E*. After the message has been written, the machine automatically reels off the exposed paper, cuts it off, passes it through the developer, and issues it finally through the slot *F*, completely developed, fixed and dried, all in fifteen seconds.

Detail views of the transmitting pencil and the variable resistance coils it controls are shown in Fig. 2, the upper view representing a side elevation, and the lower view a plan with the pencil and pencil arm broken away and the top of the casing removed. The pencil is indicated at *P*, while at P^1 is an automatic contact which closes when the pencil is swung up to the writing position. The system is active only when the pencil is held in writing position and the lamp *A* glows only when the pencil is pressed down in contact with the paper. So the act of moving the pencil across the paper to dot an *i* or cross a *t* is not accompanied by a corresponding movement of the beam of light at the receiving station. As soon as the writer is through with his message, he lays down the pencil, whereupon contact P^1 is broken and the transmitting system becomes inactive, but the developing mechanism at the receiving station begins to operate. Not until the message has been developed can another message be written. If the operator should write a second message during the period of developing, no message would be transmitted. As soon as the receiving apparatus is ready for the second message, the fact is signalled by a disk on the transmitting appartus, which shows white. Then the writer, on picking up his pencil and beginning to write, will hear a slight buzzing noise, indicating that the receiving apparatus is reproducing his message properly. In other words, "he hears himself writing at the receiving station."

Referring again to Fig. 2, the essential details of the transmitting station are clearly shown. The pencil proper is supported upon an arm which passes through a slot in the top of the casing and is pivoted upon a carriage. As the carriage slids back and forth in the slot, contact is made with the variable resistance coil R^1. As the arm swings upon its pivot, contact is made along the resistance coil R^2, which, it will be observed, is mounted upon the wheels so that it can travel toward or from the pivot, to adjust itself to the variable reach of the arm. One of the principal advantages of this apparatus is the fact that a message my be corrected; a word or line may be inserted at any point after the message has been written, and not until the operator is satisfied that the writing is just as it should be, need he drop his pencil and have the photographic reproduction developed at the receiving end. This permits of transmitting drawings as well as ordinary writing. Instead of moving a pencil at the receiving end in frictional contact with the paper, there is the practically negligible inertia of two light mirrors. This permits of operating the device rapidly and accurately. The writing may be as small as desired, while the message received, being photographic, makes a fixed record that cannot be altered. The roll of photographic paper is sufficient to reproduce a hundred messages on sheets the size of a postal card. When the roll is nearly exhausted, warning is given by special marks on the last few sheets of paper, which will serve to notify an attendant that a new roll and a new stock of developer must be placed in the machine. Very little current is required to transmit a message over a mile or more.

The Telephone Nursemaid



Telephone Extension of Mother's Ear.

Probably the youngest child to habitually use a telephone is to be found at the present time in Guernsey, where a four months' old baby sleeps every fine day in the open air with a telephone transmitter at his side by which he calls his mother on awakening, according to the *Scientific American*. Thus a problem is solved which has troubled many a busy mother who, having no nursemaid, cannot spare time to be constantly outside looking after baby and yet is not willing to deprive her child of the benefits gained by putting it to sleep in the open air.

Many a child, indeed, who strenuously refuses to sleep in the house quickly goes off to slumber when taken outside, thus showing a wisdom beyond its years. The baby here referred to belongs to the engineer in charge at Platte Fougère Lighthouse Station, who in order to allow his boy to benefit by the breezes blowing in from the Atlantic, contrived this method.

In the baby carriage is a cigar box containing the telephone transmitter and a small clock. Wires running up to the house, twenty yards away, enable the mother in the intervals of her work to listen for baby's cry. When working at the table and during meals it is easy to listen continuously.

The clock, although its use is not at first apparent, forms an essential part of the device, for the sound of its ticking provides the necessary proof that the telephone is transmitting sounds correctly. This method of employing the telephone as nursemaid has proved completely successful and is in daily use, while a rain alarm has also been evolved to give warning by causing an electric bell to ring should a shower come on.

Consolidation of Bell and Inter-State?

William C. Niblack, vice-president of the Chicago Title and Trust Company, holder of $170,000 in bonds of the Inter-State Telephone Company, Aurora, Ill., states that a plan is now on foot for the consolidation of the Inter-State and Chicago Telephone Company, representing the Bell interests. The company which Mr. Niblack represents recently asked that the Inter-State company be thrown into the hands of a receiver.

The statement is to the effect that the Bell interests now control a large amount of the Inter-State Company and it is the plan to have the Bell Company take over all of the $2,500,000 in bonds of the Inter-State Company and thus consolidate the two.

The Newspaper's Privilege

A Popular Talk on Some Features of Law Not Universally Known Among the Laity

BY WALTER K. TOWERS

IN A democracy it is especially important that the public press should be free, enlightened and accurate. The voters must govern the country by their decision at the ballot box, and to do so intelligently they must have accurate information to guide them. The place of the public prints in our system of government is recognized by the law, which extends to publications the privilege of commenting on public questions and public personages.

Among the firmly established rights of man to which the law lends its protection is the right which every man has to enjoy a good reputation. So it is that the law guards closely a person's reputation and frowns upon anything that is likely to bring a person into disrepute before his fellow men and so injure that reputation. An untruthful statement published in writing, or printing, or pictures, concerning a person which, without justification, injures his reputation is a libel for which the person whose reputation is injured may secure redress in law.

In reference to publications in newspapers a Kentucky judge said: "The public good as well as the usefulness of the press imperatively demand that no publication injurious to a citizen should ever be made unless the publisher knows beyond a reasonable doubt that the statements or charges which it publishes are in fact true. It is a matter of public importance that all statements printed and published in the press of the day should be entitled to full faith and credence and no paper should publish anv matter calculated to injure the feelings, business or standing of any citizen unless the same be absolutely true."

Every newspaper and magazine strives to attain accuracy, and if it tells the truth it is, generally speaking, absolutely protected. In a few states, as Delaware, Florida, Louisiana, Maine, Massachusetts and Nebraska, statutes have been passed by the state legislature which do not allow the publication of statements which will injure a person's reputation, even though they be true, unless it be for proper motives. In these few states one may not publish the damaging truth about another if he do so maliciously; but in most of the states the truth may be safely published, no matter what the motives.

Liberty of the press and freedom of speech mean simply that the newspaper editor has a right to publish what he will without censorship; they do not relieve from responsibility should the publication be wrongful in the viewpoint of the law. As was said in a Nebraska case, "while the liberty of speech is a sacred right, dear to the hearts of the entire Anglo-Saxon civilization, yet the lawmakers and the framers of constitutions have all realized that liberty in the exercise of any natural right, when unrestrained by law, leads to licentiousness, and have therefore wisely provided that anyone exercising the liberty of speech or press shall be held responsible for any abuse of the privilege."

While a person is carefully protected against injury to his reputation in the private walks of life and in his private business the newspaper has a much wider duty and a much wider privilege in commenting upon persons and events public in their nature. In cases in which the interests of the public as a whole are involved the newspaper has a duty as well as a right to discuss these things so that its readers—members of the public—may be informed and protected. Statements of fact should be accurate but comment and criticism of public matters so long as they are sane and reasonable and the honest opinion of the editor or his publication are justified. Of course, the newspaper is only protected in its criticisms and comments if they are made in good faith and with proper motives. The Michigan court has said: "Newspapers may discuss what relates to the life, habits, comfort, happiness and welfare of the people and in so doing may state facts, draw inferences therefrom, and express views upon the facts. Their deductions, even if false, are not actionable unless they cause special damage."

When a man becomes a candidate for office he throws himself open to fair comment and criticism. The newspaper has the right and the duty to discuss his fitness for the office to which he aspires, and may lawfully communicate facts within its knowledge concerning his character or conduct, and express an opinion upon them and inferences deduced from them, so long as it states as facts only the truth, and as opinion and inferences therefrom only honest belief. This applies to candidates for elective and not appointive office.

Everyone who publishes a book, or publicly exhibits a picture, or presents or takes part in a theatrical or other public performance, or offers to the public an article for sale or engages in some distinctly public enterprise, commits himself to the judgment of the public and the newspaper may comment and criticise. The faults or virtues of the work may be pointed out to the interested public with impunity so long as the commentator does not step aside from the work, or introduce fiction for the purpose of condemnation.

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Burglar-Proof Booths for Lincoln

The Lincoln Telephone Company of Lincoln, Neb., has installed numerous detective agencies throughout the city. The agencies are in the nature of mechanical contrivances intended to trap the man who would rob the public pay station of its worldly wealth. Anyone who tampers with the money drawer in the booth, tampers with his own freedom. An ingenious device of wire and gong makes it a near impossibility for the booth to offer up its coin without notice reaching the authorities. When the cash till opens to a certain distance, a gong sounds in some populous center of the building in which the booth is located. The gong is nicely pitched so as not to reach the ear of the tampering one. All hands are expected to answer the sound of the gong and to rush to the booth. The operation, when worked to best advantage, reaches a climax when the man in the act of robbing the till, is caught with the goods. The booth serves as a human rat trap, the wire and gong as the hidden spring, the money as the cheese. The mechanical detective is a new departure with the Lincoln Company. It has been tried out elsewhere and found successful. Officials are enthusiastic over the workings of the new device. They have experienced numerous petty losses of late from having booths robbed or partially robbed. They express themselves as confident that a solution has been found and that the pilfering will end.

Preservative Treatment of Poles and Cross Arms

Paper Read Before the Tri-State Convention, Jackson, Tenn.

BY J. B. WILKINSON

IT is a difficult matter to treat the subject of wood preservation in a short paper in a thoroughly comprehensive manner, as there are so many phases of the subject which permit of a lengthy discussion.

History teaches us that at as early a date as 400 years B. C., theories were advanced and brought to notice before the public on the preservation of timber.

Deterioration of timber by what we may term rot or decay is caused by fungus growth, the bacteria or fungi enter the timbers from the outside, and as a consequence it is necessary for the application of a preservative to the outside of the timber to prevent these bugs from entering the wood by murdering them before they have an opportunity to begin their destructive operations.

Of course, I do not mean that a treatment which is not a germicide alone affects the outside of a piece of timber is a preventative of decay, but if we have a means of subjecting this fungus bacteria to a process which will render it harmless by destroying the same, either before it enters the timber or after it has penetrated it, you can readily see that the decay is arrested.

You will therefore appreciate that it is necessary to prepare the path of entrance of these germs in such a manner that the germs cannot live, and then you may ask the question, how much penetration of the preservative is necessary to be beneficial and accomplish the result of preserving the wood.

By some the question of penetration alone seems to be considered without due regard to the preservative qualities of the liquid with which the wood is treated, and I have seen several samples of timber treated with a so-called wood preservative where the timber was discolored for a great distance—in fact, almost the entire piece of wood showed a discoloration, which proved that the penetration was thorough.

It is an easy matter to secure great penetration of wood by different kinds of oils, and this can be illustrated by making a mixture, using oils or acids and a coloring matter to show that certain liquids will penetrate to a great distance, but the fact that the timber so treated may show a discoloration, proving that the penetration was complete, does not by any means indicate that the timber treated in this manner will be preserved, because the oil or so-called preservative which has been absorbed by the wood, if it is a preservative, must be of such a nature that it will not leach out of the wood, and as a consequence must be practically non-volatile and contain valuable preserving qualities, so that it will remain in the timber and at the same time exert a destructive influence on the bacteria or fungi to such an extent that they cannot live where the preservative remains.

It is possible to take, say, kerosene oil and lamp black, turpentine and lamp black or any simple light oil which carries with it a discoloration, and treat a piece of wood and prove conclusively that the timber so treated is thoroughly penetrated as the wood will show a discoloration in the inner parts when the same is cut into or sawed through, but this penetration does not prove anything to us as to the preservaton, because we all know that petroleum oil or turpentine oil evaporates very rapidly, and after the wood which has been so treated has been exposed for a number of years, a chemical analysis will show that while the wood may still show a discoloration to possibly a great depth, there will be nothing remaining in the wood from this treatment which will contain a preserving quality; therefore the question of penetration should be liberally considered, and it should be borne in mind that timbers which have been treated and show a thorough penetration should also show that the substance which has been injected into the timber, or has penetrated the same, has a preservative quality.

Another factor that should be considered is to obtain a product or substance which does not close the pores of the wood, because frequently timbers, such as cross arms, poles, cross ties and such like, may not be thoroughly seasoned, and if a so-called wood preservative is used in treating such timbers, closing the pores of the wood, such treatment will imprison or seal up the dampness in the wood, thereby causing fermentation, and as a result we will eventually have what is termed dry rot.

The preservative must be one that is a germicide and that allows moisture to penetrate the timber through the treated portion, whether it is a thin film or a depth of one inch or more, and the fact that the pores are not closed will permit this moisture to evaporate through this same path as it entered the wood.

Dr. Dean, of Yale University; Dr. Alleman, of Swarthmore College (formerly with the U. S. Forest Service); Dr. Moore, chief chemist of the Western Union and Bell Companies; Dr. Richardson, chief chemist of the Barber Asphalt Company, and others were expert witnesses in the U. S. Customs trials, and every one under oath testified that they considered the high boiling, pure, unadulterated coal tar distillates to be the best for preserving wood, and the United States Court of Appeals in its decision, May 26, 1913, concluded that a high boiling coal tar oil of practically non-volatile qualities was exceptionally of high value when used for the preservation of timbers and wood exposed to the action of weather, moisture and influences which would ordinarily tend to produce decay.

There are practically two methods of preserving timbers against decay. One method is to fill the pores of the wood with a substance which will prevent the entrance of fungi or wood destroying bacteria, and there is no question but that timbers so treated and thoroughly filled with a substance insoluble in water, if the same will remain permanently in the wood, and has the proper germ destroying qualities, will preserve the wood, but it has been shown that it is a difficult matter to accomplish this, except at usually a prohibitive cost.

Another method is to use a wood preservative which does not close the pores of the wood, permeates the cell walls of the wood, and if this contains the proper germ destroying properties, such a treatment

proves much more valuable, if the substance which has penetrated the wood remains in the cell walls and has the properties for destroying the germs which may enter with moisture.

Referring to the first method the United States Forestry Service in November of last year made some exhaustive tests as to the comparative efficiency of various wood preservatives, as to the volatility of high boiling coal tar oils in comparison with coal tar creosote.

We know a timber thoroughly impregnated with creosote would be preserved for a great length of time, if the creosote which was injected into the timber would remain permanently, because a piece of wood which is treated with creosote is preserved as long as the creosote remains in the wood, but we also know that creosote leaches out, and that then the moisture can enter through the pores of the wood, which have become vacant on account of the evaporation of the creosote, and this moisture or water carrying bacteria or fungi will deposit these germs on the fibers of the wood which may have become exposed by the creosote having evaporated and decay or what we term rot as a consequence will begin.

The United States Forestry Service in making tests of the efficiency of wood preservatives, report in November, 1913, that comparing the volatilization of creosote and high boiling pure, unadulterated coal tar oil as follows:

Tests were made on a specially prepared piece of Noble fir ⅞x1⅞x6 inches in size.

Six pieces were selected for the test. They were placed in an electrically heated oven, maintained at a constant temperature of 40 degrees Centigrade, which is 104 degrees Fahrenheit, this temperature being regulated by a thermostat, and the pieces of wood permitted to remain until they ceased to lose weight. A moderate and constant current of air was turned on by means of an aspirator, the air being dried before entering the oven by being passed through calcium chloride towers, in order to prevent the specimens from absorbing moisture.

These pieces were taken from the oven and placed together with the coal tar creosote and the high boiling, pure, unadulterated coal tar oil at 180 degrees Fahrenheit in containers and then placed in a treating cylinder 1½x4 feet in the wood preservation laboratory. Compressed air was applied at 125 pounds per square inch pressure and maintained for a half hour. The pieces were then removed and the amount of oil absorbed by each determined. They were then replaced in a constant temperature oven and kept there for twelve weeks. During this period, three pieces of each set were removed and weighed as a whole, once each week and separately once each month.

The results on both coal tar creosote and high boiling coal tar distillates are given in the government test table, working plan L. 117, and the pieces treated with coal tar creosote absorbed an average of 13.45 pounds per cubic foot, the pieces treated with a high boiling, pure, unadulterated coal tar distillate absorbed an average of 15.1 pounds per cubic foot. At the end of twelve weeks, the pieces treated with coal tar creosote had lost 22.2 per cent of the amount injected, and the pieces treated with a high boiling, pure, unadulterated coal tar distillate had lost .3 per cent of the amount injected.

These results show the comparative volatility of coal tar creosote as compared with a high boiling, pure coal tar distillate.

Therefore, as the efficiency of the treatment depends on the preservative qualities of the treatment, combined with the permanency of the treatment remaining in the wood, the preservative used should be practically non-volatile and germicidal and not close the pores.

History proves that after 3,000 years of perfect preservation, Pettigrew extracted the preservative from the heart of an Egyptian mummy and putrefaction set in immediately, and this experiment proves that it was the abiding place of the antiseptic which prevented decay.

Samuel B. Boulton presented a paper before the Institute of Civil Engineers in England in 1885, and from Mr. Boulton's collection of data and records of experiments and investigations it was proven conclusively that it was the high boiling coal tar oils, which remained in the timber for a period of 32 years which preserved it, as all the low boiling oils which were contained in the tar oil with which the timber had been treated had evaporated or leached out, thus proving that the presence of the antiseptic in the coal tar oil distillates which remained in the timber was the cause of these timbers not being attacked by decay producing germs.

Similar tests and investigations were made by the United States Forest Service by extracting from the timbers the remaining coal tar distillates after the timbers had been exposed to rot for periods up to 40 years, and the analysis of the oil which had been extracted showed that it was a high boiling coal tar distillate which remained in the timber, as these distillates were insoluble in water and practically non-volatile and germicidal.

There are several methods of treating poles and cross arms with wood preservative, one of which is the brush treatment, which is the most convenient, and the immersion or dipping treatment, both of which are recommended, but of course the dipping treatment it is readily seen is the most efficient, as the wool preservative can be heated to the proper temperature and this temperature be maintained to a constant degree and the pole or cross arm immersed or dipped in the treating tank for a sufficient length of time until the preservative has impregnated the wood to a certain depth.

The proper treatment of poles and cross arms not only prevents decay, but will arrest deterioration caused by rot and decay. The Memphis Telephone Company in 1904 found that some of the untreated poles used in the construction of highly elevated leads had begun to decay. The dirt was excavated from around certain of these poles to a depth of about 18 inches and one coat of high boiling, pure coal tar distillate was applied. R. H. Polk, general manager of the Memphis Telephone Company, advises that these poles show every evidence of lasting at least ten years longer.

The decay of poles is generally confined, especially at the beginning of deterioration; to a point beginning from 12 to 14 inches above the surface of the ground to a foot and a half to two feet below the surface, so that in treating the butts of poles, either by dipping them or applying the brush treatment, the preservative should be applied to the pole butts, so that the treated portion will extend 18 inches or more

above the ground surface. All crevices and checks should be filled, and in using the brush treatment, do not apply the second coat until the first coat has been fully absorbed.

The gains and tops of the poles should receive two coats of preservative.

Poles exposed to danger from marsh fires, prairie fires, also exposed to destruction by horses and animals gnawing the same should be treated to a point 4, 6 or 8 feet above the ground line.

To get the best results in using a high boiling tar distillate it should be heated to 150 to 200 degrees Fahrenheit.

In treating cross arms, a very convenient method is to use a tank to contain the wood preservative, and if high boiling, pure coal tar is used, heat the same to a temperature of not less than 200 degrees Fahrenheit, and immerse the cross arms in this liquid, the same to remain from five to eight minutes, the length of time depending on the density of the timber.

Where wooden anchors are used, as they are expensive to install, it is good economy to treat the same before they are buried in the ground.

To secure the best results, all timbers which are to be treated with a wood preservative should be thoroughly seasoned as possible, as it is apparent that the more thoroughly seasoned the timber is, the more readily it responds to the penetration of the preservative.

The larger telephone companies have begun to realize that it is an expensive proposition to replace wood construction, particularly as timber has advanced in price over the value of 10 or 15 years ago, but the actual cost of the timber to be replaced is generally exceeded by the cost of the labor necessary to effect the replacement, and if cross arms, poles and exposed woodwork can be treated at a comparatively small cost, and thereby enable the telephone companies to secure an insurance at less than cost than by other means, the question of wood preservation cannot be overlooked.

As there is a law compelling the manufacturers of various products, such as the foods we eat, the liquors we drink, and especially insecticides, to label their packages, stating definitely the component parts of the same, it seems to me that we as an association should endeavor to persuade our congressmen to get a law passed requiring manufacturers of so-called wood preservatives to label the same in such a way that the component parts are printed in plain English, as at the present there is no law compelling the producer of so-called wood preservatives to show the contents of the product, and if it is an advantage for the insecticide to be labeled under the pure food and drugs act, wood preservative, which also may be considered an insecticide, should, in my opinion, be subjected to the same restrictions.

If the cross arm or pole were gifted with the power of speech, no doubt each would say, "treat me well, and I shall remain with you always."

The Value of Trade Journals

The trade journal is probably the most alive to the exigencies of education, and the gratification of the mental needs of its readers, of any other press production.

It asks, absorbs, gives.

Take up a trade journal; note the quality and texture of the paper, the clearness of the type, the beauty of its arrangement, the logic of its arguments, the well-expressed opinions of its contributors.

Then tell me if it isn't an education—beautiful, inspiring, strengthening.

Thousands of trade journal subscribers are receiving mental uplift and renewing their courage by its means.

The trade journal is the leader of the literary world.

It applies chiropractic methods to managerial meningitis, the numerical neuritis of the cashier, or the comatose business man.

As a spinal adjuster the trade journal is a necessity. Without it there is great danger that the glooms will get you.

It manipulates the dislocated vertebrae of declining business, until the spinal irritation walks its chalks, trundles its hoop, and you climb your buzz-wagon again, and let 'er zip Gallagher!

The trade journal keeps the red corpuscles turkey-trotting and prevents pseudo-anginalitis or imitation heart disease.

It helps you push your business, thereby obviating nerv. pros. For nervous prostration is never occasioned by you pushing your business; it only happens when your business pushes you. The trade journal is the Pathe Weekly of the subscriber.

It gives vivid character sketches of the passing great. It takes extensive tours over the fields of science, business and invention. It teaches by living, moving word-pictures the reasons for the failures and the causes of success.

Sarcasm and caricature turn many a trick.

The business of religion is now giving place to the religion of business; and the trade journal is the evangel of the true brotherhood of co-operation and self-respect.

Show me the man who subscribes to and reads his trade journal and you will show me a man who will "show me"—a man alive, alert, ambitious, educated, successful. He has learned to ask, to seek and to find.—Elbert Hubbard, in July *Philistine*.

Michigan Tests Connection Law

A test case of the Michigan state law ordering physical connections between competing telephone companies is expected as a result of an order issued by Judge Hosmer, in the Detroit circuit court, directing the railroad commission and the Citizens Telephone Company to show cause why it should not be enjoined from making a connection of the wires of the Citizens company with those of the Michigan State Telephone Company. The Citizens company is located in Grand Rapids. The larger company claims that by being forced to give connection for long distance calls it is made to give the smaller company the opportunity to use a large equipment, with a resulting profit and is unable to obtain similar service from the smaller concern.

Louis Steinberger of the Electrose Manufacturing Company is the patentee of a flexible electric conductor of novel construction. It is so arranged that a removable surface may be renewed when worn out. The conductor is intended especially for trolley and catenary work.

Fitting Applicants for Railway Wire Service

Paper Read Before the Association of Railway Telegraph Superintendents

BY J. B. SHELDON

WE RECOGNIZE that this is a subject that is becoming more prominent and important from day to day, not only on account of the increasing difficulty of securing the necessary help to fill our telegraph positions, but also on account of our desire that the intelligence and ability of such help may be equal to the constantly increasing demands of the service. The time was, in the quite recent past, that any one who could telegraph to some extent was considered a full-fledged "operator," with practically nothing more to learn, whether or not he had any particular education or other knowledge of railroad work. Now the conditions are different, because, with the more scientific and systematic plans of railroad operation and the numerous national and state laws to understand and observe, better educated and more intelligent help is required to secure the desired results. It is true, innumerable high-class employes have grown up in the service in the past, without any particular education or qualifications at the start, but they were energetic and diligent and would have won their way in any line of work. The average telegrapher did not care to learn or do much more than to telegraph, which, even with the less complicated system of handling and accounting for the business, as compared with the one now in vogue, made it difficult for us to fill satisfactorily many vacancies in agencies.

At the present day, it is very important not only that the beginner should learn to be a good reliable operator, but that he should have a fair education and seek to become proficient in the knowledge of station work in general, so as to be prepared for and to enable him to be in position to obtain promotion to an agency, which is the natural line for his advancement. The old way of picking up helpers locally along the road, with view of making operators of them, was a very slow process and frequently many who were thus secured could never be expected to qualify for operators' positions or to do much more than ordinary station drudgery. They often lacked ordinary education, had no ambition for promotion, and, living at home at very little expense, were satisfied indefinitely with the small salary received.

It is considered important that beginners in this line of work should start when fairly young, preferably from 16 to 18 years of age, after securing a good common school education, as they can then learn more readily than when older and, until they qualify as operators, they are better satisfied with the small wages allowed them as helpers, than in the case of older students whose needs are likely to be greater. They should be bright and industrious, they should have an earnest desire to make a success of the work, their habits should be good, they should be courteous and it is essential that they should be qualified to pass a rigid physical examination, especially with respect to eyesight and hearing. As, without previous opportunity for study and practice, it takes an indeterminate length of time for helpers at stations to progress even fairly well in telegraphing, owing to the lack of time in which to practice, and often the withholding of encouragement and help by others employed at stations, it is necessary, in order to meet the demands, that telegraph schools should be maintained to prepare at least partly those who desire to enter the service.

If the demand for station helpers on railroads was quite uniform the year round, the railroads could no doubt operate schools for providing telegraph help for their own stations to very good advantage; but, as the calls for such help are very uncertain and fluctuating, it is probable that better general results can be had by encouraging and patronizing reliable schools outside of railway service on account of the larger field for selection that is afforded.

Railroad telegraph schools would be preferable in some ways, especially in the matter of the selection of the students. Only such applicants should be accepted in railroad schools as would appear to be reasonably well fitted for development in the service, and those not making progress should be dropped; while most of the outside telegraph schools accept everybody who can pay the necessary tuition, whether or not they show any promise of making desirable employes, and the railroads are then expected to take care of the undesirables along with the better material. The graduating of inferior and unsatisfactory students is a handicap to these outside schools, as well as to the railroads, as such men cannot be used to an advantage and the impression is created that the schools are more or less failures. The success of the telegraph school, in the minds of those who come in contact with the situation, depends much more upon the quality of the graduates than upon the number of the students graduated.

In outside telegraph schools, it seems to take the average student about four months to complete the course, which, besides contemplating a school proficiency in telegraphing to the extent of from 18 to 20 words per minute, usually embraces a brief course in arithmetic, spelling, typewriting and practice in penmanship. The last mentioned is a very important qualification, in which we find most of the students, as well as graduates, are extremely deficient. All schools should require more penmanship practice and not permit their students to graduate until they are able to write in a good plain manner. Nearly all of the outside schools have succeeded in securing connections with local railroad wires for use in their advanced practice rooms, which is very desirable. It is believed the railroads should encourage the outside schools by arranging for these connections as far as conditions will permit.

After graduating from outside schools, students are usually far from qualified to be of real assistance as helpers to agents at stations, much less to be used a operators, and it is considered that a finishing course under railroad directions is desirable to fit them better for positions as station helpers. After completing such a course they can be of substantial help to the agents from the state, which usually causes the

*Superintendent of Telegraph, Union Pacific R. R.

agents to take more interest in their welfare and progress and is of more benefit to them. A railroad finishing school should be equipped with dispatcher, railroad message and commercial telegraph wire connections, to enable the students to keep up their telegraph practice, a certain length of time per day, approximately three hours being assigned to such practice. Various station forms and report blanks should be supplied, so that the students can become familiar with them. Rules and instructions of the various departments, including freight, passenger, baggage, express and telegraph tariffs, should be provided for their study.

Instead of going too much into detail and embracing too wide a field of study, this finishing course, which is intended to cover a period of approximately a month, should treat more of the essential duties that are usually required of helpers, such as.

Sealing cars and making seal reports;
Checking cars in yard and making car reports;
Making bills-of-lading, freight bills and way-bills;
Copying way-bills and daily reports;
Making abstracts of freight received and forwarded;
Western Union rules, rates and reports;
Sale of local tickets and making ticket reports;
Checking baggage and figuring excess and storage charges;
Express rates and billing and reporting express;
Filing freight and passenger tariffs;
Use of "Official Guide," time table folders, etc.

In addition, general instruction may be given in regard to switchboards, wire testing and patching, instruments, batteries and the use of telephone train dispatching, equipment, although these duties do not devolve directly upon the students until they become operators.

They should also be instructed as to the value of courtesy to patrons, as well as to fellow employes; the necessity of obeying instructions from their superiors; and the desirability of taking an interest in their work and in the business and affairs of the road in general. They should understand that it will generally devolve upon them to keep the station clean and orderly; to carry mail to and from the post office; to handle freight, baggage and express; and to do whatever other work may be assigned them—so they will not have the mistaken idea that clean clerical work is all they will have to do.

It is considered that this railroad school preparation is largely for the benefit of the railroad, so that no tuition or other expense in connection therewith should be charged the students. Without the railroad school, most of the instruction outlined above would be left for agents to give upon the arrival of the new helpers at their stations; but agents are usually too busy with their own duties to pay at all times close attention to their helpers, and, as a consequence, much is likely to go wrong with new helpers who have not had previous general instructions concerning their work.

The cost of this railroad finishing school instruction, where a fair number of students is provided for, averages only about $10 per student, which is very nominal for the benefits derived. Before students are taken into the railroad finishing school, they should pass the prescribed physical examination, so there may be no question as to their qualifications in this respect for service on the road upon the completion of the course.

After putting the students through the finishing school and assigning them to helpers' positions at stations on the road, they must still be supervised, to see that they have some opportunity to practice telegraphy and that they are promoted to operators' positions as soon as conditions will permit after they are considered to be fully qualified and have passed an examination to show their ability. Helper positions should pay enough so that the students assigned to them can pay their board and properly maintain themselves, in an economical manner, until they are promoted to operators' positions. It is desirable to have helpers' positions at different rates of pay and to promote the helpers to better paying positions from time to time, as conditions will permit, so as to keep them better satisfied and to compensate them more and more as they become of greater value.

It seems to take, on an average, about a year for the students to secure telegraph positions, after beginning to work for the road as helpers. They frequently become discouraged with this seemingly long wait, especially, as is often the case, if they were led to believe when entering an outside telegraph school that operators' positions awaited them immediately upon graduation, and much encouragement and patience from agents and officials is usually required to keep them in their positions until they finally achieve their ambition and become actual operators.

There is frequently a proneness on the part of dispatchers to hesitate to work with newly-made operators, which, considering their responsibilities, is quite natural; but this hesitancy should be limited to taking suitable precautions for safety, rather than be applied to such an extent as to keep qualified students from occuying operators' positions.

In some states laws have been enacted that have interfered very much with the promotion of qualified students to operators' positions. In one state, a law was passed preventing the use in night operators' positions of operators under twenty-one years of age. This has been a great discouragement to students, as most helpers cannot afford to wait, with small rates of pay, until they reach the prescribed age, while in other lines of work they can do better. We have endeavored to secure a modification of this clearly unjust law, so as to permit the use of operators 18 years or more of age in night positions, but so far without success. In another state there is an unqualified law against the employment of operators who have not had experience as such for a year or more. This is clearly unreasonable and impracticable, in that its general application, would entirely prevent additions to the supply of operators, and it ought not to exist. We should watch for and try to prevent or to modify such extremely adverse legislation, which is not only unjust to the young men who are struggling to secure a place in the world in their chosen field of endeavor, but which handicaps us greatly in our efforts to develop a sufficient and satisfactory staff for our needs.

Then, with their acquired knowledge of station work and the railroad service in general, the students should, after their promotion to operators' positions, be ready to advance as far as conditions, their ability and ambitions permit.

A very desirable feature in connection with the

training of our own operators, as far as conditions will permit, is that they usually stay with us, instead of traveling about the country, as experienced operators coming to us from other places are very prone to do. As a demonstration of this, we can point to the fact that, after a few years of effort in this respect, about one-third of the operators now employed on this road are of our own training; and, in addition, they understand our road, its methods and business much better than could be expected for a long time from those trained elsewhere.

Correspondence school courses may be provided for those who wish to receive instruction and to progress in certain lines of railroad work; but, ordinarily, there is hardly enough demand on any one railroad, for any particular line of instruction, to warrant the expense of providing such courses. Generally, such courses, on nearly all pertinent subjects, can be arranged for by the employes themselves with schools that are prepared to supply operators to any road, to a better advantage than for the separate roads to provide their own courses.

A Wood That Never Rots

Engineers have often to deplore the rotting of railway sleepers, of piles, and of wood used to support galleries, in the building of ships, etc. Engineers, chemists, physicists, biologists, doctors, who, for the construction of diverse apparatus, may require a wood possessing a maximum resistance to the causes of destruction, particularly humidity, are interested in this important question of the unputrescibility of wood. The ideal would be to find a wood of a character susceptible of resisting putrefaction naturally. Now it appears from recent researches that the wood of the mangrove tree may be considered as absolutely unputrescible. Numerous samples of mangrove wood (*Rhizophora racemosa*) sent from French Guinea were, in 1909, placed at Collonges (Côte d'Or) in a soaking pit in the depot of sleepers of the Paris-Lyons-Mediterranean Railway Company. The samples were surrounded with all the elements susceptible of producing the decomposition and rotting of the wood in a minimum of time. In spite of these precautions the samples have up till now remained in an excellent state, and show no signs of the least alteration. Why is putrefaction unable to attack the wood of the mangrove? From whence do the particular and excellent qualities of this too little known wood proceed? It is first of all to be remarked that the grain of the mangrove wood is very close; for this reason it opposes a barrier to the invasion of water, by a quasi-mechanical action. To get an idea of the importance of this fact, it suffices to examine comparatively the densities of the woods of the mangrove, oak, and fir. The first is about 110, the second 70, and the third 40. Moreover, mangrove wood has an amount of tannin quite sufficient to prevent the invasion of insects and to prevent the multiplication of germs, damp, mould, and all various micro-organisms which constitute the flora of the woods of different climates. The wood of the mangrove marvelously resists flexion; its resistance is double that of oak, quadruple that of fir; nevertheless, it is not at all brittle. To crushing either at the end or across the fibers it offers a resistance double that of oak and three times that of fir. It resists admirably the efforts of wringing or twisting, far better than the two other woods mentioned, to which it is far superior in suppleness. With these qualities just enumerated it is easily worked; it is as easily sawn as the oak. From the few preceding remarks we may conclude that the wood of the mangrove merits employment on a large scale and for purposes both numerous and varied. Henceforth its use appears to be indicated for the construction of the posts of electric lines on account of its unputrescibility, its resistance, and its suppleness. Its resistance to putrefaction and to crushing render it precious for the construction of sleepers of narrow railways. Its use would be advantageous compared with other woods for the special wood-work of mines, where it would offer all the qualities required by hygiene. And, besides, everyone will find good use for a wood that never rots.—*Chemical News.*

The "Insolent" Telephone

The "Insolence of the Telephone" is reported to have been discussed at a business men's luncheon in New York the other day. The plaint was that it was just as rude and annoying when engaged with a visitor to be interrupted by a call on the telephone as by any other intrusion. The telephone, it was said, has no respect for any man, no matter what he is doing or how he may be engrossed. Persons get instant access over the telephone who could not get recognition in the ante-room. The remedy proposed was to refuse to answer calls when receiving visitors, giving the preference always to the caller who paid the honor of coming in person.

But turn the thing around. Suppose this exclusive gentleman desires to talk to some one over the telephone, and, although he knows the other party is in his office, is told he is engaged, how will he feel about it? The telephone is allowed to be "insolent" and intrusive because of the general recognition that the celerity and value of the service depends upon the courteous co-operation of the subscribers. The telephone is one really democratic institution. It is no respecter of persons. And that is one of its great values. But if would-be exclusive persons decide to answer it only when it suits them and that spirit should spread what would be the outcome? The caller in person does not resent the interruption of the telephone because he knows he has had the same experience, and it is part of the game. And as to the honor of a personal call, is there nothing to be said for the supposition that he who has not time to pay a personal call should be entitled to prior consideration.

Diminishing Secondary Noises

According to the German periodical *Umschau,* a Swedish engineer named Saxenberg has invented an effective device for eliminating, or at any rate greatly diminishing, adventitious noises in telephone conversation. The device consists of a variable water-resistance. One such apparatus is provided near each of the transmitters, and the person speaking can, by adjusting the electrodes in the water resistance, regulate conditions to such effect that secondary noises are reduced to a minimum.

An extraordinary credit of M. 39,000,000 for telephone purposes has been voted by the German Reichstag, to be spent partly on transforming the overhead service to underground, as poles are found to be unable to support the large number of wires now required, and partly on new stations and extensions of networks. In the matter of the number of stations and of local networks, it is claimed for Germany that she stands at the head of all European states.

Recent Telephone Patents

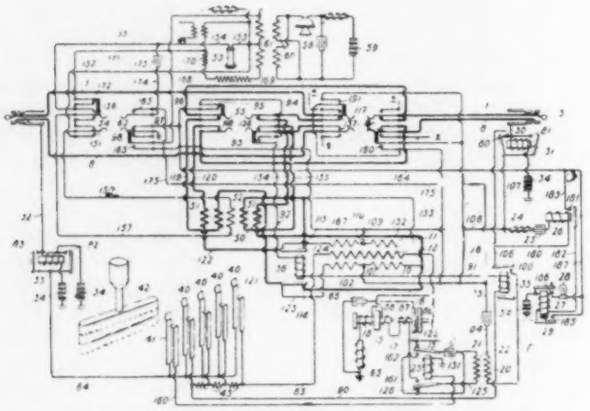
A Brief Digest of those Current Specifications Most Interesting to Telephone Men

BY DAVID S. HULFISH

PATENT No. 1,073,692. For a Voice Current Repeater. To Charles D. Lanning, Boston, Mass. (Application filed June 5, 1907.) To avoid the packing of the granules in the carbon cell in a special repeater, a mechanical arrangement causes the carbon cell to rotate periodically to loosen it.

1,073,708. For a Receiver Holder. To Hugo C. Raiber, Pittsburg, Pa. A clamp upon the column of a desk telephone has an arm pivoted upon it to carry the receiver and hold it at the ear without the use of the hand. The pivoted arm has a notch with inclined edge so that when the holder arm is swung up and the telephone is out of use the inclined notch edge will engage the hook lever and depress it, releasing the hook lever again as the receiver is again drawn down for use.

1,073,748. For a Telephone System. To H. J. Fay, Westboro, Mass., and E. C. Molina, East Orange, N. J., assignors to American Telephone & Telegraph Company, Boston, Mass. (Application filed October 12, 1907.) A call distributing system for manual telephone switchboards by which automatic switches are associated with the answering equipments and ringing plugs of the operator's positions at the manual multiple, and by which the automatic switches act in an assigned order in the different operators' positions, to pick up calling lines for service by the different operators in rotation.



1,074,298.

1,074,286. For a micotelephone. To W. B. Oliver, Collingswood, N. J., assignor to Oliver Electric Company, Philadelphia, Pa. (Application filed July 27, 1909.) An arrangement of a large carbon block with pockets of granules and adjusting springs.

1,074,298. For a Telephone Speech Repeater System. To Herbert E. Shreeve, Milburn, N. J., assignor to Western Electric Company, New York, N. Y. The system has a cord pair in which a speech relay may be included by operating a manual controlling key after the plugs have been connected to lines, the speech relay being disconnected by electromagnetic apparatus when the plugs are withdrawn from the jacks, so that the speech relay may not be included unintentionally upon any connection as a result of its having been used in a prior connection.

1,074,648. Telephone Receiver Stand. Morris Schwartzberg, Chicago, Ill. A standard to stand upon desk or table, has a clamp at top to grip the telephone receiver and to release it readily to permit the receiver to be hung up upon its hook normally.

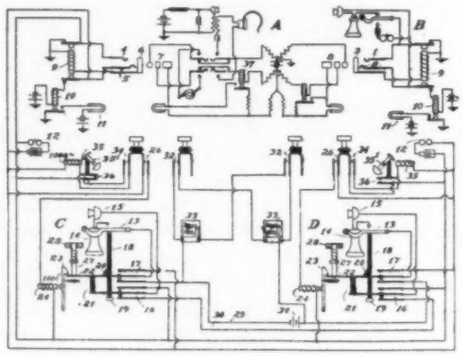
1,070,726. Harmonic Selective Telephone System. Arthur F. Poole, Wheeling, W. Va. (Application filed February 4, 1907.) Harmonic or tuned ringers are used, each telephone station having a tuned ringer and also a relay which is responsive to current of different character from that of the ringer. It is necessary thus to send out two currents, one suitable for operating the relay to put the ringer in circuit, and the other suitable for operating the ringer. This combination of elements enables the inventor to show in his patent a party

1,075,079.

line of eight stations without station earths, all ringing currents being over the two wires of the line.

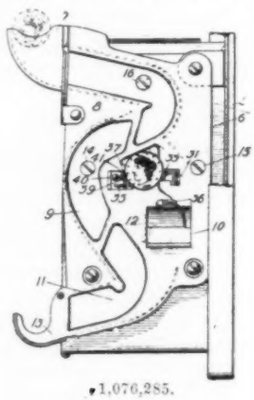
1,074,677. Telephone Call Counter. Samuer D. Williams, Newport, Wales. (Application filed October 31, 1908.) The counter is located at the subscriber's telephone instrument and is operated by an electric current from the central office. The subscriber when calling the central office places the counter in circuit and the current which operates the counter also removes the counter from the circuit. A duplicate counter for each line is also provided in the central office.

1,075,007. Automatic Telephone Switch and System. J.



1,075,260.

G. Blessing, Chicago, Ill., assignor to Automatic Electric Company, Chicago, Ill. In the set of relays for controlling



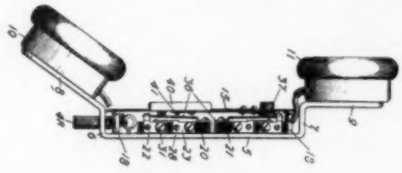
1,076,285.

a Strowger automatic switch, one relay is provided with two armatures, a quick armature and a sluggish armature.

1,075,079. Cable Sleeve. Samuel A. Armstrong, Niles, Ohio, and Pyrl T. Aumend, Warren, Ohio. This is a mechan-

ical cable sleeve rendering the wiped joint unnecessary, and also making convenient the act of opening a cable joint. Two rings are attached by pouring solder to the two sheaths of the cables to be joined, and a coupling drum or sleeve then may be clamped to the rings by screw threaded clamps.

1,075,257. Party Line System. Morton L. Johnson, Chicago, assignor to Corwin Telephone Manufacturing Company, Chicago, Ill. A speech lookout device at the telephones of a party line, a polarized relay operates a local magnet to



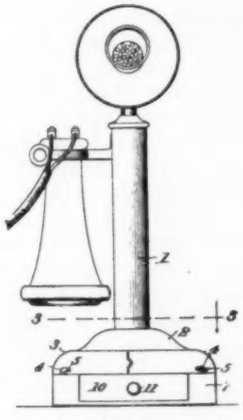
1,075,423.

close the telephone bridge when a key is depressed, but when the line is in use the direction of potential upon the line is reversed, the polarized relay does not operate the local magnet when the key is depressed and the telephone bridge is not connected to line. The patent shows an automatic telephone set in which the call sender also is kept from the line wires when the line is busy.

1,075,258. Call Recording System for Automatic Exchanges. Morton L. Johnson, Chicago, Ill., assignor to Corwin Telephone Manufacturing Company, Chicago, Ill. The calling telephone is provided with a counter and the speech circuit is arranged at the central office so that the calling subscriber may hear but may not speak until after the counter has been operated. Operators at the central office have power to enable the calling telephone to speak without actuating the counter.

1,075,259. Telephone System. Morton L. Johnson, Chicago, Ill., assignor to Corwin Telephone Manufacturing Company, Chicago, Ill. In a telephone system having a common battery and an automatic central office, a party line has two stations which are able to talk together without passing a call through the central office.

1,075,260. Telephone System. Morton L. Johnson, Chicago, Ill., assignor to Corwin Telephone Manufacturing Company, Chicago, Ill. Two stations upon a party line may speak together without calling through the exchange and



1,078,117.

when either calls through the exchange the other station of the pair is locked out from the line.

1,075,423. Telephone Hand Set. Roy R. Ireland, East Orange, N. Y., and Albert F. F. Gilson, Closter, N. J., assignors to Western Electric Company, New York, N. Y. A strip of heavy gauge metal has the transmitter upon one end and the receiver upon the other, with switch springs mounted in the middle portion, a cover cap over the switch springs completing the frame of the hand set.

1,075,430. Automatic Telephone System. Frank R. McBerty, New Rochelle, N. Y., assignor to Western Electric Company, New York, N. Y. The system of testing in an automatic telephone switch closes the test circuit for two test periods to make a double test.

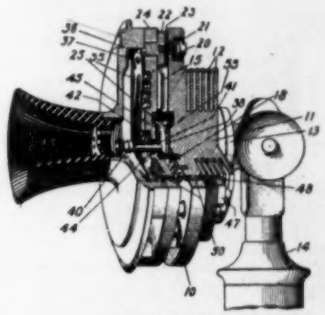
1,075,485. Pay Station. George A. Long, Hartford, Conn., assignor to Gray Telephone Pay Station Company, Hartford, Conn. The telephone has both coin slot and counter, and is fitted with an audible signal device and means for normally holding the audible signal inoperative.

1,076,020. Automatic Telephone Switch. E. E. Clement, Washington, D. C., assignor to the Clement International Engineering Corporation, Camden, N. J. (Application filed May 17, 1910.) In a switch similar to the Strowger the spindle does not slide in its journals, but is pivoted in a sliding rack.

1,076,041. Transmitter. William Kaisling, Chicago, Ill., assignor to Kellogg Switchboard & Supply Company, Chicago, Ill. The carbon cell has a spring upon the front electrode against which the sound diaphragm presses to move the electrode.

1,076,149. Automatic Telephone Switch. J. N. Reynolds, Greenwich, Conn., and Amos F. Dixon, Newark, N. J., assignors to Western Electric Company, New York, N. Y. A rotatable shaft has disks carrying striking points which strike against fixed springs to close electrical circuits in different combinations for different angular positions of the shaft.

1,076,285. Coin Collector. William F. Hosford, West Chicago, Ill., assignor to Western Electric Co., New York, N. Y. The coin chute has two pins for stopping a coin in suspense. One of the pins is movable by the coin to close electrically against a fixed stop. The other pin is removable by an electromagnet to let the coin drop. At the same



1,077,373.

time that the coin is dropped a further pin may be projected into the coin channel to direct the coin into a return chute if so desired. This differs from an older type in which one of the stop pins was withdrawn.

1,076,908. Attachment. C. T. Porter and R. J. Osborne, San Francisco, Cal. A perforated screen is normally held against an antiseptic pad and is drawn down over the mouthpiece when the telephone is being used.

1,076,990. Telephone Call System. C. W. McGonigle, Algona, Wash., assignor to Globe Telephone Company, Seattle, Wash. A specific arrangement of parts whereby a calling signal may be received upon a high resistance telephone receiver which is caused to close a local alarm circuit.

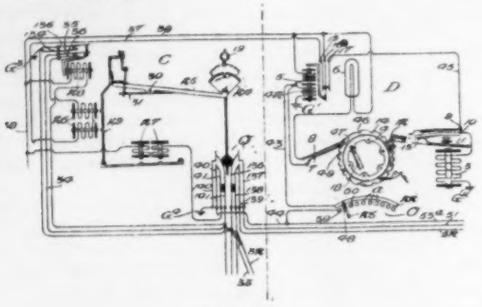
1,077,185. Party Line System for Automatic Exchanges. Fritz Aldendorff, Antwerp, Belgium, assignor to Western Electric Company, New York, N. Y. A ringing-selecting switch selects among several sources of supply and determines which source of ringing current shall be applied to the selected line. The ringing-current selecting devices are to be fewer in number than the line selecting devices.

1,077,225. Hand Set for Automatic Telephones. A. E. Keith, Hinsdale, Ill., assignor to Automatic Electric Company, Chicago, Ill. The telephone hand set usually comprises a handle with a receiver on one end and a transmitter on the other. In this case the Strowger dial is added at the receiver end of the handle, and back to back with the receiver.

1,077,373. Transmitter. Herbert E. Shreeve, Milburn, N. J., assignor to Western Electric Company, New York, N. Y. The transmitter has a double carbon chamber, the front and back electrodes being stationary, and a middle

movable electrode being provided with a pin passing through the front electrode to the diaphragm. The claims are upon structural details.

1,077,753. Switchboard System. Homer J. Roberts, Evanston, Ill., assignor to Homer Roberts Telephone Company. (Application filed September 5, 1905.) A system for calling and ringing upon step-by-step party lines. Each cord-ringing key is associated with the source of ringing current and also associated through a master key with pulsating current for stepping.



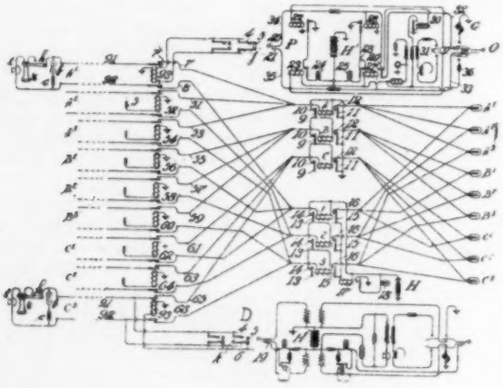
1,078,685.

1,077,900. Warning Device for Telephone Booths. A. E. Ayer, Boston, Mass., assignor of part to John Baxter, Boston, Mass. A sign, "Please Pay Toll," is pivoted upon the booth door and is swung into a conspicuous position when a patron is leaving the telephone booth.

1,078,106. Harmonic Relay. Kempster B. Miller, Chicago, Ill., assignor to McMeen & Miller, Chicago, Ill. (Application filed July 17, 1909.) The relay as a whole is constructed like a tuned ringer, the contact points being at the end of the tapper rod, and the contact points being so arranged that their circuit is continuously closed while the armature is vibrating, yet open while the armature is not vibrating.

1,078,117. Attachment. Willard Wood, San Francisco, Cal. A little cabinet subbase for a desk portable telephone set is provided with clamp means to fix it to the bottom of the telephone set. It contains a drawer intended to contain paper pad and pencil.

1,078,229. Signaling System. H. G. Webster, Chicago, Ill., assignor to Kellogg Switchboard & Supply Company, Chicago, Ill. (Application filed September 4, 1906.) In this system of signaling, two sets of relays serve as annunciators



1,078,229.

for a number of lines equal to the number of relays in one set multiplied by the number of relays in the other set, the number of relays thus being less than the number of lines served. Confusion in signals when several lines call at the same time is prevented by making the relays interdependent so that two relays of the same set cannot be charged at the same time.

1,078,577. Telephone Bracket. Farnham Fox, New York, N. Y. (Application filed July 1, 1909.) A hollow supporting arm is pivoted at one end to a fixed bracket and at the other end to the telephone. Two slide rods inside the hollow arm also are attached to the bracket and the telephone and are arranged to slide past each other as the telephone is raised or lowered, the rods being provided with a spring between them to counterbalance the telephone.

1,078,685. Line Distributing Switch. A. E. Keith, Hinsdale, Ill., assignor to Automatic Electric Company, Chicago, Ill. (Application filed July 21, 1908.) This is the first patent to issue upon the mechanism of the Keith line switch. The switch comprises a set of telephone lines and a series of trunk lines and its function is to connect a calling telephone line to an idle trunk line.

South America as an Export Field

In the contest for the trade of South America three nations—England, Germany and the United States—are the great competitors, according to a publication, "South America as an Export Field," just issued by the Bureau of Foreign and Domestic Commerce of the United States Department of Commerce. Germany and England both lead the United States, the former having in 1912 about $177,100,000 of the import trade and the latter $275,400,000, as compared with $152,900,000 of imports supplied by the United States. Several causes have contributed to this lead of the two European countries, but the chief one is that both have been on the ground and working for the trade for many years. The exporters of the United States have made serious efforts to enter the market only in the last four or five years. The very large amount of British capital invested in all parts of South America has also been an important factor in promoting British trade, while the German thoroughness in matters of detail and the German banks have served to build up an enormous German import trade.

The publication mentioned gives a short survey of the geographical, economic and commercial features of the countries of South America, and is intended to serve as a basis of study of the markets there by prospective American exporters. The principal departments of production in each country, such as agriculture in Argentina, the coffee and rubber industries in Brazil, and mining in north and west coast countries, are described at some length, and opportunities noted for furnishing supplies for these industries. The transportion system of each country is reviewed and plans for future construction noted. While the investment of British capital in railways in nearly every South American country has given British railway materials a great lead, those from the United States are making steady advance and there is apparently a good trade in prospect for them. The latest available statistics of foreign commerce of each country are given in the monograph and the proportion of the imports supplied by the three leading countries—England, Germany and the United States—in recent years is set forth. It should prove of interest to all business men whose attention has been turned toward the southern continent as a field for future trade promotion. Copies of the bulletin (South America as an Export Field, Special Agents Series No. 81) can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 25 cents per copy.

The man who spends all his money on clothes is working for the man in the looking-glass; probably no one else notices or cares how he dresses anyway.

Of Interest to the Trade

What the Telephone and Accessory Manufacturers Are Doing to Advance the Art

Automatic Equipment for Tampa, Fla.

An order for 3,250 lines of full automatic central office equipment has been placed with Automatic Electric Company of Chicago by the Peninsular Telephone Company for its Tampa, Florida, exchange. The apparatus is to be of standard design and will give straight line, party line and P.B.X. service. This initial installation will meet the immediate requirements of the city, but it is so planned as to allow for a growth to 10,000 lines within the near future, for it is anticipated that the increase in the number of subscribers will be very rapid during the next few years.

The Peninsular Company was organized in 1901 and after a period of very keen competition with the Southern Bell Telephone Company, absorbed its rival and now gives exclusive service throughout the counties adjacent to Tampa Bay. For the past two years the Peninsular Company has been operating a semi-automatic district station of Automatic Electric Company's manufacture, in West Tampa. The company, therefore, has had experience with this apparatus, and the fact that it is planning to cut the entire plant over to this type of equipment may fairly be considered as evidence that it has found it satisfactory in operation.

For some time past the company has been rehabilitating its outside construction in Tampa, as well as the outlying country, special pains being taken with the city construction to so plan it that the location of branch offices and district stations, which have been found to be especially economical under automatic operation, will be a very simple matter when the growth of the number of subscribers makes it advisable. The company will also be able to give "rapid fire" toll service by equipping the exchange boards in its outlying territory with dial calling devices, thus enabling its operators to call Tampa subscribers direct, and permitting a toll service very practically as rapid as local service.

The equipment is to be installed as promptly as possible, and it will be in service not later than March first of next year. The Peninsular is the second Florida company to install automatic equipment within the past twelve months, the Jacksonville Home Telephone Company having ordered a plant for Jacksonville last October.

Detroit Insulated Wire

The Detroit Insulated Wire Company of Detroit, Mich., announces the following reorganization as of June 25, 1914.

Joseph H. Hunter, president of the company, was one of its original incorporators, served as vice-president and general manager and succeeded to the presidency on February 20, 1914, the present prominence of the company in the wire field being due to his efforts. Mr. Hunter was formerly vice-president and general manager of the National Cable & Wire Company, and has been identified with electrical matters and manufacturing for many years.

J. G. Splane, the new vice-president, is a Pittsburgher by birth, in which city he received his education and is a graduate of the University of Pittsburgh. He held a responsible position with the Standard Oil interests from 1887 to 1903, and on May 18 of that year was elected president of the Pittsburgh & Allegheny Telephone Company. As a protectory measure on the part of the minority stockholders, Mr. Splane and the Hon. William Flinn were appointed receivers for the company on January 10, 1911, and on June 1, 1914, the property was re-transferred to its stockholders and the receivership terminated, Mr. Splane at that time being named managing director of the company.

By reason of his connection as director with several manufacturing enterprises, his diversified business experience and his acquaintance in the telephone field, Mr. Splane's association with the Detroit Insulated Wire Company should be of great benefit to that company, and such a result is confidently anticipated.

James Inglis becomes chairman of the Board of Directors, he having been connected with the company as a stockholder since its inception. Mr. Inglis' business career practically originated with the American Blower Company, he being identified with that company since early manhood and as its president for the major portion of the time, and under his management it emerged from comparative insignificance to its pre-eminent position. He is also a director of the National Bank of Commerce and the Michigan Savings Bank, was one of the organizers of the Detroit Board of Commerce and its president from April, 1906 to April 1, 1907, and is also financially interested in and officially connected with a number of other going concerns.

Mr. Inglis lends to the Detroit Insulated Wire Company his broad and well-balanced business experience, and while his official connection with the company is largely in an advisory capacity (his energies continuing to be devoted to the American Blower Company), it is felt the moral effect of his official association with the Detroit Insulated Wire Company will make for added strength and influence.

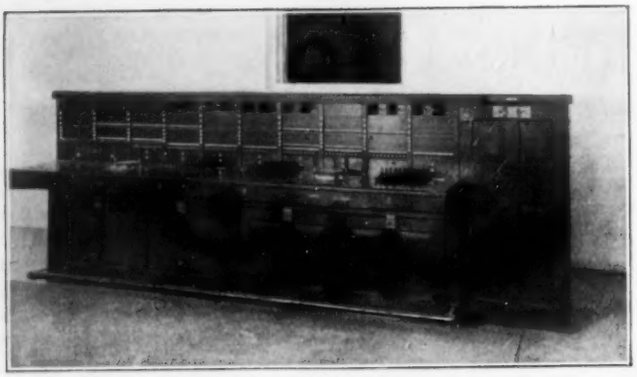
C. C. Gray, the secretary and treasurer, has had charge of its selling activities since September, 1912, and formerly held a similar position with the National Cable & Wire Company.

W. G. Dalgleish, the assistant secretary and treasurer has been advanced from an inferior position with the company through diligence and merit.

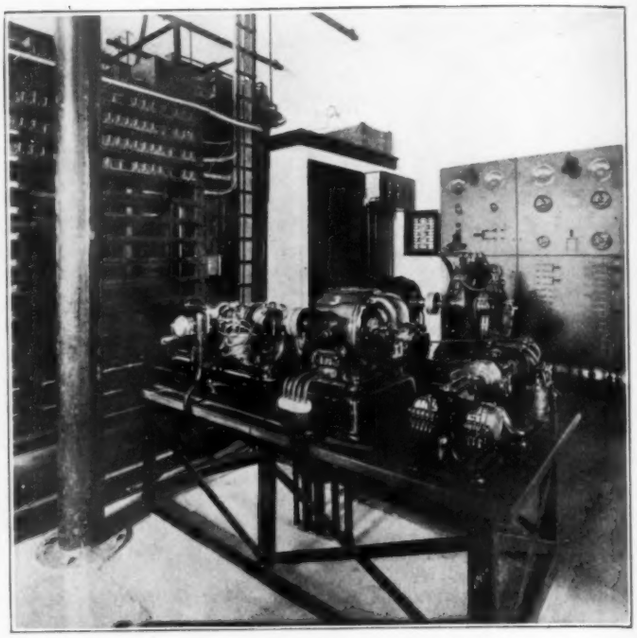
The new official arrangement is looked upon with much favor, and it is confidently expected that the company will profit largely by the change.

Phenomenal Telephone Increase

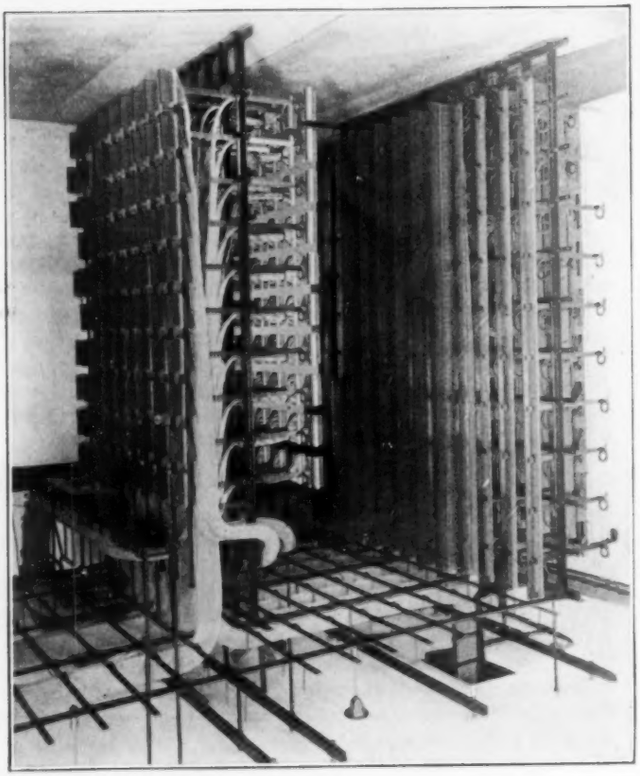
The growth of the American Telephone & Telegraph Company's system, while naturally somewhat affected by the current depression in all lines of business, still continues at a rate much larger than might be expected under existing conditions. A report of the company indicates that in the first six months of the year the Bell system added 307,000 new stations, an increase at the rate of 614,000 a year, or a gain of 7½ per cent. The actual increase in the first six months of 1913 was 350,000 stations. On July 1 the Bell system owned 5,640,000 stations besides connecting with 2,800,000 other stations. In the three years since 1910 there has been an increase of 3,000,000 stations.



Toll Switchboard.



Power Apparatus, Switchboard and Coil Rack.

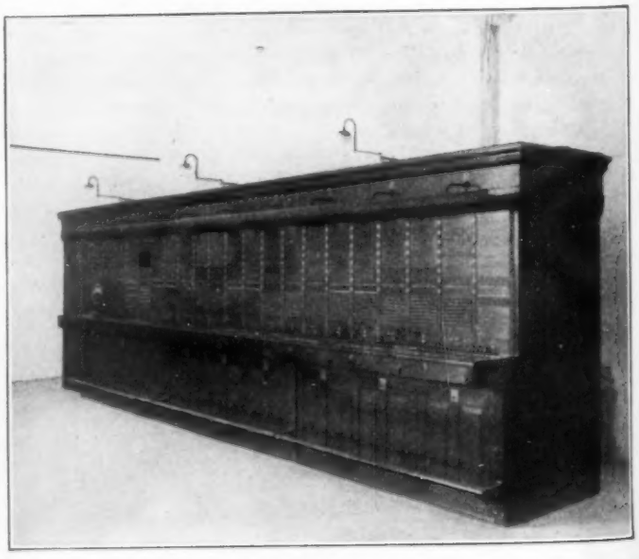


Main and Intermediate Distributing Frames.

Wire Chief's Desk.

Chief Operator's Desk.

Storage Battery Room.



Subscribers' Switchboard.

Some Views in the New Exchange of the Orange County Telephone Company, Middletown, N. Y.

The Central Office at Middletown, N. Y.

The Orange County Telephone Company of Middletown, N. Y., recently cut into service a complete new central battery central office equipment in its new exchange building at Middletown. Several reasons influenced the decision of the telephone company to install the new equipment. Owing to increasing business, additional switchboard sections were deemed necessary but as a result of this very fact the overhead wire plant was rapidly becoming too congested for the good of the service, so that putting the wires underground in lead covered cable presented the only logical remedy. As the new plant work could not be carried on in connection with the old central office, it was decided to erect a new building and put in entirely new equipment that would be the most modern obtainable. The new switchboard with the frames and racks has been furnished and installed by the Western Electric Company, who also furnished the emergency equipment of switchboard sections, frames and racks installed after the exchange had been destroyed by fire in 1908.

The new equipment consists of a subscriber switchboard, toll switchboard, wire chief's desk, chief operator's desk, frames, racks and power plant.

The subscriber switchboard has an initial equipment of 1,200 lines, each of the three seven-panel sections having a capacity of 4,900 subscriber multiple and 300 outgoing trunks on a five-panel basis with a present equipment of 40 trunks. In addition to the subscriber and outgoing trunk lines, 30 rural lines and 60 toll answering jacks form a part of the present installation.

The first position of the subscriber switchboard is used as a testing position and contains cords from the wire chief's desk for testing purposes as well as other test and pluggng up cords. The second position is used as a combination rural and switching position and is equipped with 6 rural switching trunks and 14 universal cord circuits. The rural and toll line answering jacks appear in the front equipment of this position. The third position is used as a combination switching and subscribers' position and is equipped wth 7 subscriber operators' cord circuits and 16 toll switching circuits. These toll switching circuits are used for switching calls from the toll switchboard to subscriber lines. Positions 4 to 9 inclusive are subscriber operators' positions. Each is equipped with 15 subscriber cord circuits.

All the subscriber operators' cord circuits are of the repeating coil automatic ringing and listening type which operate as follows: To answer a call the operator takes the cord nearest the face of the switchboard and plugs into the answering jack of the calling party. This operation automatically connects her telephone to this cord circuit. After ascertaining the number desired she takes the front or calling plug and tests the jack of the number desired. If this is not busy she completes the call by inserting the plug into the jack. This operation automatically cuts the telephone circuit off of the cord circuit and also starts the ringing current which rings intermittently until the called party answers. When the subscriber answers, the ringing current is automatically cut off and the answering and calling parties are connected. This circuit relieves the operator of having any keys to handle in making a connection, thereby making far more efficient and economical operation.

Besides the equipment outlined each operator's position is equipped with an instruction circuit, outgoing call wire, operator's telephone ringing and cord auxiliary signal circuits. Each panel in which rural, toll or subscriber answering jacks are installed is equipped with a supervisory signal circuit.

The toll board which is known as No. 1 relay toll switchboard consists of two-panel, two operators' position sections. Each section has a capacity of 300 multiple toll lines and 400 multiple outgoing trunks. The present equipment consists of 60 multiple toll lines and 40 multiple outgoing trunks with 60 toll answering jacks. In addition to this 10 recording trunks, multipled in each section, are provided.

The first three positions of the toll switchboard are each equipped with 10 cord circuits, which provide the highest possible grade of transmission for long distance connections, operators' telephone, cord, auxiliary ringing and outgoing call wire circuits. Each panel is equipped with recording trunk or toll answering jacks and is equipped with an auxiliary signal circuit. A 40-volt battery is used on the talking circuits on the toll switchboard.

The wire chief's desk is fully equipped for making all tests required of a wire chief for locating trouble on lines entering the exchange. For making these tests the wire chief is provided with two circuits from his desk to the switchboard ending in a cord and plug. These plugs may be inserted in any jacks in the multiple of the first section and give the wire chief a means for testing through the equipment in the exchange. In addition to this the desk is provided with testing circuits running to the main frame and ending in special plugs which may be connected to the lines entering the exchange. In this way the wire chief can cut off the exchange equipment when he desires to make accurate tests on outside lines. This is particularly desirable when making tests on cable trouble or on toll lines.

The chief operator's desk is a two-position desk, one position being arranged for the chief operator and the other position arranged for the information and monitoring operator. Each position is equipped for three cord circuits with a capacity of 6 cord circuits per position. The desk is also equipped with three automatic incoming trunks from the subscriber switchboard, 3 ringdown trunks, 20 outgoing trunks and 30 monitoring lines. Of the latter 20 monitoring lines are for the "A" board and 10 for the toll board. These monitoring lines are wired to the various operators' telephone circuits, enabling the monitoring operator to listen in on each operator's telephone set.

The battery supply is secured from two sets of eleven cells each, "Chloride" accumulators. One set is type F-11 and the other set is type F-9. The elements for these batteries are contained in glass jars which are mounted on trays filled with sand, the trays being provided with standards which insulate them from the floor. The current for charging the storage cells is secured from a 3-kw. 22-30-volt 100-ampere generator direct connected to a 220-volt 60-cycle three-phase, 5½ h. p. 1,160 r. p. m. full load alternating current motor.

The ringing current is supplied from two outfits made up of the following: First, one 72-88 volt, 1-ampere ringing generator belt connected to a 220-volt 60-cycle three-phase, 1,720 r. p. m. motor. Second, 1-ampere ringing generator rated at 1,000 r. p. m. connected to a battery driven direct current motor which is designed to run on a battery voltage of 19 to 23 volts. The ringing machines are equipped with interrupters for giving intermittent ringing, busy back and trouble back signals.

Kellogg Equipment Times Motor Race

The automobile hill climbing contest held recently at Mount Summit, Pa., was an event of national importance in automobile circles. A record-breaking crowd attended and it is estimated 15,000 people crowded the course at the finish while both sides of its three-mile length were lined with machines loaded with spectators.

Beautiful S-Shaped Curve in Mount Summit Course.

Car owners were assessed $5 apiece for position on the course.

The Mount Summit course is a comparatively recent find and automobile manufacturers and professional racers declare it to be the best hill course in the country. The finish is 1,400 feet above the starting point, there being about an 8 per cent grade.

A feature of special interest was the timing device designed for the event by A. M. Crichton, of the Tri-State Telephone Company, at Uniontown, Pa., and made up by the Kellogg Switchboard & Supply Company. With the assistance of Don C. Gould of the Kellogg

Equipment and Officials at the Starting Point.

company the equipment was arranged to operate in the following manner:

Two wooden stakes were placed on opposite sides of the road and a string stretched, two feet above the ground, from one through the other to a brass lever located on the apparatus, which was placed a little way from the roadside. This circuit breaker or lever arrangement may be noted in the illustrations showing the equipment and some of the officials at the starting point.

The instant the wheels of the racer struck the string and broke it, the lever was released, operating a sounding key at the other end of the course. The key had an extension to the stop watch, which was placed in an upright position in a socket, and when operated, dropped on the stem of the watch and started the scoring.

While the car was making the run, the watch was placed in another bracket and as the car broke the string at the finish, the extension dropped on the watch stem in the manner of the first, stopping the watch and recording the time to a fraction of a second.

The power was supplied by storage batteries of 150 amperes in a 10-cell battery. Ordinary copper wire was run along the course a few feet from the ground. In

Timing Apparatus in Operation at the Finish, D. C. Gould Standing

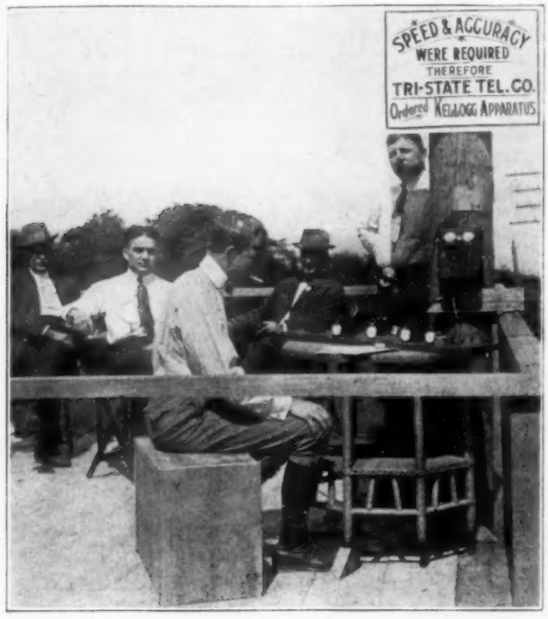
order to preclude any possibility of breakdown the equipment was all in duplicate. Everything worked out to the entire satisfaction of officials and racers, however, and it is quite likely that Mr. Crichton will have his device patented.

During the race communication to various points on the course was provided, there being ten Kellogg telephones in service; one standard wall set in a booth at each end, and six sets at interventing points. In addition to this, a private wire connection was established for the official timekeeper at each end. In the illustration showing the timing apparatus in operation at the finish it will be noted that the official timekeeper has a desk stand and head receiver for direct communication with that official at the starting point.

The telephones on this line were the Kellogg standard desk sets. With this arrangement officials at both ends of the course and along the way were all in direct

communication with each other and consequently everything proceeded smoothly to the satisfaction of everybody.

Having a connection at various places along the route made it possible for the man in the booth at the finish to keep the crowd informed as to the progress of



Timing Apparatus, Showing Full Equipment.

each car. "C—— has just passed the second watering trough," or "A—— crashed into embankment at the Turkey's Nest." Announcements of this kind served to keep the interest up while the racers were on the road.

Automatic Very Successful in Argentina

On page 24 of the July issue of TELEPHONE ENGINEER was an item headed "Construction Work in Argentine." This article stated that automatic equipment was in process of installation in Cordoba, and was, in a sense, on trial there. The fact is that the 2,000 line Cordoba exchange has been in operation for several months, since late in March, 1914, and has proved entirely successful and satisfactory; so much so, in fact, that a 5,000 line installation has been ordered for Rosario, Argentine, which is now in course of construction. As George Franklin, chairman of the United River Plate Telephone Company, which operates these exchanges, remarked at the last annual meeting of the company, held recently in London:

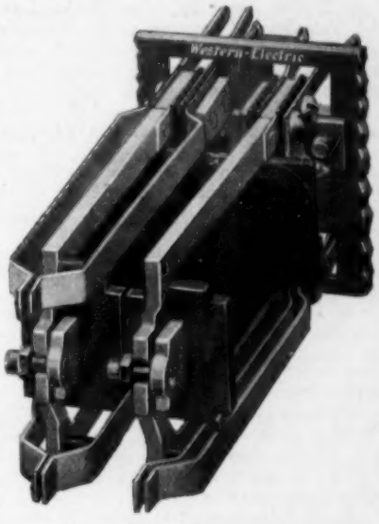
"We have installed a new automatic exchange at Cordoba itself, and although it has been opened less than three months, the most gratifying reports have been received. The public are very satisfied with the service, and even the press are congratulatory, which is saying a good deal in Argentine. A second exchange of the same type—that is, the Strowger automatic—is on order for the city of Rosario, and we hope by the end of October to have it erected and working."

The latest issue of the Reliable Electric Company's loose-leaf catalogue, showing that company's splendid line of protective equipment, connectors and tools, should be in the hands of every telephone man.

Telephone Relay No. 194

During 1912 the Western Electric Company placed on the market a new telephone line and cut-off relay known as the No. 194 in which were incorporated some new and important advances in the telephone art. The successful performance of the new relay, of which 60,000 are now in actual daily service in over sixty different exchanges, is the direct result of extensive laboratory tests and trial installations in several operating exchanges. All of these tests and trial installations were made before the relay was finally marketed to make absolutely sure that only satisfactory apparatus would be offered to customers. The operation of the relay has not only been satisfactory, but the absence of maintenance trouble has justified the claim made for it that the fundamental design guarantees lower operating cost.

The flat construction of the No. 194 type relay makes it the most compact line and cut-off relay on the market. Ten of these relays can be mounted on a standard mounting plate 19 inches long by 1 23-32 inches wide. Each strip of ten is enclosed in a dust-proof cover, as it has been found that this type of common covering makes the relays accessible and convenient for inspection and adjustment. Furthermore, it is not necessary to place an individual magnetic shield around the No. 194 relay, as the cut-off relay in the Western Electric line circuit is not connected with the talking pair. In certain other types of relays on the market the condition exists wherein some of the windings of line and cut-off relays are connected with the talking pairs during conversation, making it necessary that individual covers be placed over each relay. This magnetic protection to prevent cross-fire between relays is unnecessary in the 194 type.



Western Electric's New Relay.

In addition to having successfully designed a relay which gives satisfaction from an electrical standpoint, the mechanical design is such that no foreign particles can settle on the contacts of the springs and so cause trouble, inasmuch as the springs are all mounted on edge. Furthermore, every contact is plainly visible when the dust cover is removed from the mounting plate. In other words, the contacts, which are the parts that most concern the trouble man who inspects a relay are where they can be readily seen and easily adjusted if necessary. The air-gap adjustment between the armature and the pole piece can be made from the back of the relay and the distance between the pole piece and the relay armature watched while the adjustment is being made. This feature is only found in this type of relay. In order to protect the windings of the cut-off relays from moisture and mechanical injury, each coil is covered with a serving of cotton which is then heavily shellaced. Each relay is mounted individually and can be removed by simply taking out two machine screws.

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES.

J. W. Benham, secretary and treasurer of the Naugle Pole and Tie Company; Mrs. Benham, and W. P. Bowring, secretary and treasurer of C. H. Worcester & Co., were killed in an automobile accident at Ravinia, Ill., Sunday night, July 26. Messrs. Benham and Bowring, both of Chicago, were very well known to the telephone trade through their long connection with the pole business. They had a host of friends in both fields who will be shocked and grieved by this news.

J. K. Aeton, for the past two years commercial manager for the Central Union Telephone Company in Beardstown, Illinois, has tendered his resignation.

C. T. Notesworthy, formerly local manager for the Cumberland Telephone Company at St. Francisville, La., has been appointed manager of the Donaldsville exchange.

R. R. Mills, wire chief for the Bell Telephone Company at Kingman, Kas., has resigned.

A. J. Coster has succeeded A. Larson, resigned, as general manager of the Inter Township Telephone Company, of Hinckley, Ill.

Arthur Williams, former manager of the Bell Telephone Company, at Traverse City, Mich., is the new manager of the Petoskey exchange, succeeding C. C. Kelly, who was transferred to Ann Harbor.

J. T. Ward, has resigned as manager of the local telephone company at Malvern, Iowa, and L. W. Davis has been selected as his successor.

B. C. McCauley, plant foreman of the Cumberland Telephone and Telegraph Company, for the Athens district, Tennessee, has been transferred to Chattanooga.

J. B. Gaffney, who succeeds R. R. Hartford as district foreman at Norfolk, for the Nebraska Telephone Company, arrived from Deadwood, S. D., to take charge.

William McClellan has been appointed confidential engineer to the Public Service Commission of the First District of New York in connection with the valuation of the New York Telephone Company's property.

A. F. Schouboe of Hastings, is the new commercial manager of the Lincoln Telegraph and Telephone Company, at Superior, Neb.

Fred Rhetts has charge of the Farmers' Telephone lines at Fortescue, Mo.

Richard Hawkey, has been appointed vice-president and general manager of the Pittsburg and Allegheny Telephone Company. Mr. Hawkey was formerly assistant to the vice-president of the Eastern Group of the Bell Telephone Company.

L. C. Johnson, district construction foreman for the Mountain States Telephone Company, in Colorado, was seriously injured when he fell a distance of thirty feet over a cliff at Beulah. His recovery is doubtful.

August 1, Charles Schemel will assume the duties of manager of the Gilroy Telephone Company, of California, succeeding his brother Julius, deceased.

John B. Pierce, of Syracuse, former general manager of the Onondaga Independent Telephone Company, and lately associated with the New York Telephone Company, has been appointed senior telegraph and telephone engineer for the Eastern district of the Interstate Commerce Commission with headquarters in Washington, D. C.

NEWS FROM THE FIELD.

ALABAMA.

The Southern Bell Telephone & Telegraph Company has purchased a lot on Washington street, Salem, and is now having plans drawn for a building which will be erected on same within the next few months.

The Southern Bell Telephone Company plans extensive improvements in the system in Birmingham to be installed at an early date.

ARKANSAS.

The two telephone systems of Waldron have been combined and sold to Jake Hill and George Forrester. The consideration was over $7,000.

The Southwestern Telephone Company is remodelling the old and installing a new switch board for the local telephone service in Fort Smith.

At a meeting of the Arkansas city council recently, the Texarkana (Home) Telephone Company was authorized to take over by purchase the local plant and other properties of the Southwestern Telephone Company, consolidate the two companies and operate them as one.

CALIFORNIA.

The Roseville Home Telephone Company, recently reorganized, has received its new charter, which brings it into conformation with the new laws. It now is the Roseville Telephone Company.

Work has been started by the Pacific Telephone and Telegraph Company upon the installation of its underground wire system in Oroville.

The Pacific Telegraph and Telephone Company of Riverbank, moved the phone office into its handsome new headquarters in the Land company's building which has just been completed on Santa Fe street.

DELAWARE.

The Porto Rican Telephone Company, with a capital of $1,200,000 was chartered at Dover by residents of Wilmington.

Limhi Telephone Company, of Wilmington, capital stock $20,000. Directors, Harry W. Davis, C. J. Jacobs, W. W. Pusey and H. B. Bothum of Wilmington. The company will operate a telegraph and telephone service in Idaho and Montana with extentions in other states.

IDAHO.

The Farmers' Inland Telephone Company, which names as its principal place of business Melrose, filed with the auditor of Nez Perce county articles of incorporation. The capital stock is $2,000, divided into 100 shares of $20. The life of the company is placed at 25 years and its business will be to build, equip, own, operate and maintain an independent telephone system. The officers and incorporators are: C. J. McConnell, president; H. R. Croson, secretary; Lee Lucas, S. S. Sardam, George L. Johnson and E. F. Stamper.

ILLINOIS.

Fifty new underground circuits will be installed between Evanston and Wilmette by the Chicago Telephone Company, at a cost of $12,000.

The Interstate Telephone & Telegraph Company, paid $1,579 to the city of Elgin for the 1,579 telephones it is operating in that city.

A new telephone company has been formed in Hanover. George Steele, W. D. Irwin, Charles Gray, J. A. Speer and Elmer Steele being the incorporators, taking over the company which George Steele has hitherto owned and constolled. The new company will take charge of the business in August.

The new Stewart telephone office of the Chicago Telephone Company, 7559 Eggleston avenue, Chicago, was opened July 11.

The Stark County Telephone Company is putting its wires underground in the business part of Toulon.

Orville D. Zook has purchased the Kilbourne telephone exchange and has assumed charge.

The Chicago Telephone Company will expend $30,000 to enlarge and improve switchboard facilities in the Joliet exchange.

INDIANA.

The Indianapolis Telephone Company has in operation a new exchange at Forty-fourth street, just east of Central avenue. The company opened the exchange to visitors soon after it was in operation, when the public had an opportunity to inspect these latest inventions in telephony. The Forty-fourth street exchange is the largest and among the first of its kind in the world.

Menden Telephone Company, Ingalls, $120; to operate telephones. P. G. Shirley, Ingalls; L. Wiseman, J. N. Cotty.

The Merchants Mutual Telephone Company of Michigan City, has taken steps for extensive improvements, principal of which will be the placing of all wires and cables underground in the congested district of the city.

Between five and six hundred telephones of the Home Telephone & Telegraph Company, of Fort Wayne, were put out of

business by a recent storm. Many fuses were burned out by the lightning and a great number of wires and several cables were blown down. The damage to the lines was the most extensive the local company has suffered for a long time.

The Citizens' Telephone Company, of Decatur, has asked the public service commission for permission to buy the Union Telephone Company, of Berne. The purchase price is to be $710. the two plants operate in the same county.

The Dubois County Telephone Company has bought out the Cumberland Telephone Company in Jasper, and assumed control July 1.

July 1, the Cathcart & Smith Telephone exchange at Westville passed to the control of the LaPorte Telephone Company, although for the present the title will remain in the name of J. Vene Dorland, who purchased the exchange and goodwill of the business. Under the new public utilities law the local corporation is not permitted to take over the exchange without the permission of the state commission and until this permission is granted, Mr. Dorland will hold the title.

IOWA.

The Farmers' Mutual Telephone Company now occupies its new quarters in the north room of the Linderman building, Clarinda.

Material is being hauled for the new building to be erected for the Lenox Telephone Company.

The telephone exchange at Allendorf has been purchased by D. D. Garberson.

Work has been started on the new building for the Harlan & Avoca Telephone Company, at Durant street, Harlan.

At the annual stockholders meeting of the Mount Pleasant Telephone Company, the following were elected officers: President, Dr. A. O. Pitcher; vice-president, Jos. M. Green; treasurer, Fred Van Hon; secretary, Chas. A. Gregg; directors: Joe M. Green, Chas. A. Gregg, Frank B. Montgomery, C. Sumner Smith, and A. O. Pitcher.

The Wayne County Telephone Company has been granted a telephone franchise for the county of Corydon. Work on the new plant will be started in a short time

To connect Rock Island and Davenport with a submarine cable instead of the cables now carried across the river on the Government bridge, the board of directors of the Central Union Telephone Company, at a meeting in Chicago recently, decided to appropriate $88,000 The cable will be run from the foot of Eighteenth street in Rock Island to the foot of Brady street in Davenport, giving better service.

KENTUCKY.

The Whitesburg Telephone Company is changing its place of business from Whitesburg to Pikeville.

Pattieville Mutual Telephone Company, Pattieville; capital, $2,460. Incorporators, Charles Davidson, J. F. Shrader, James N. Sapp and others.

MICHIGAN.

The Michigan State Telephone Company announces a proposed expenditure of $45,000 in cables and other line improvements to be made in the district north of the Boulevard and west of Woodward avenue, Detroit, within a few weeks. At the same time it is said about $15,000 will be spent in line improvements west of Woodward avenue and south of the Boulevard.

At an estimated cost of $250,000, the Michigan State Telephone Company will begin in a short time the installation of an entirely new system in Muskegon and the erection of a fine two-story cut stone and terra cotto central building on its property at the northeast corner of Western avenue and Third street, now occupied by the Magoon & Kimball office.

Improvements to be made in the wiring and underground cables of the Bell Telephone Company of Battle Creek has been started, and will be continued for the next ten months at an expense of $125,554 to the corporation.

An expenditure of $70,000 has been authorized by the Michigan State Telephone Company for telephone improvements in Saginaw this year. Announcement was made by district manager H. R. Mason. Part of the present system will be rebuilt and telephone facilities serving all parts of the city will be increased.

MINNESOTA.

Work will soon begin on the line of the Farmers' Telephone Company, recently organized for the purpose of connecting the small communities to the west and north with Deer River and the county seat. The project contemplates the stringing of wires into the following townships: Lake Jesse, Sand Lake, Township 148-27, Goodhope, Third-River, Alvwood, Moose Park, Nore, Ardenhurst, Grattan, Popple and Wirst. Connections will be made at Grand Rapids with lines running in all directions.

A telephone line between Bemidji and Rosby and connecting with the Bemidji exchange at the city limits, is being built. The line will be known as the Rosby and Grace Lake line. There are twenty on the subscription list, the company being co-operative. Its officers are: A. W. Hawkins, president; Gunder Moi, secretary, and Edward Trolin, treasurer.

The new telephone line between Wabasso and Wanda has been completed.

The new Drexel exchange of the Northwestern Telephone Exchange Company, at Minneapolis, has been opened.

MONTANA.

The poles for the telephone system to be installed in the village of Simms have arrived, and it is announced that the building of the line will begin in a short time.

A. R. Johnson has left with men and material for Confederate gulch, where the Government is building a telephone line across the gulch and across the Big Belt divide. This work will be pushed to completion in order that the forest rangers may have it for use before forest fires get started.

The Mountain States Telephone and Telegraph Company is planning the investment of $100,000 in Park county and Livingston in the near future.

At the annual meeting of the stockholders of the Flint Creek Telephone Company, Philipsburg, three directors were elected to serve for one year, as follows: Axil Sandin, John Shoblom and J. A. Gillies.

East Flathead Telephone Company, to furnish telephone facilities to residents of East Flathead creek, in Gallatin county and Park county. Office at Sedan, Gallatin county. Incorporators, James L. Francis, Orville J. De Fields and Harry R. Riechman, all of Sedan. Capital, $5,000, of which $225 has been subscribed.

MISSOURI.

An addition to the local switchboard at the Missouri & Kansas Telephone Company's building, at Springfield, involving an expenditure of between $35,000 and $40,000 will be made in the next two months, according to W. B. Bentley, division traffic superintendent.

NEBRASKA.

Paul A. Krause and Victor W. Krause have purchased the interest of M. G. Needham in the Albion Telephone Company.

The Lincoln Telephone and Telegraph Company is constructing a direct line from Seward to David City and Columbus. Work is now progressing along the line in the southern part of the county.

NEW YORK.

The new $50,000 building erected by the New York Telephone Company in Barrett street, Schenectady, is rapidly nearing completion.

The private branch telephone exchange which workmen have been installing at the New York Central offices at Watertown for several months past, has been put into operation.

West Winfield Telephone Co., Herkimer, Oneida and Otsego counties, $10,000; E. W. Wilcox, West Winfield, N. Y.; H. W. Wilcox, F. C. Wilcox, West Winfield.

Work of installing the new 10,000-line switchboard in the main exchange of the New York Telephone Company, at Rochester, has been 65 per cent completed. The new board is expected to be installed early in September, and on the evening of September 14, sometime before midnight, service will be cut over from the old board to the new.

NORTH DAKOTA.

The Home Telephone Company is erecting a branch line east of Hannah.

The contract for the construction of the telephone line that will connect St. John with Fairview, was let by the Fairview Telephone Company to L. Beaudoin, who expects to have the line ready for service immediately.

The Western Telephone Company will construct a rural telephone line to be connected with the exchange of Dickinson. The line will be fifteen miles long and will reach into the territory northwest of the city.

The Washburn telephone exchange has been sold to J. W. Arvig of Fargo.

At the meeting of the Norton Telephone Company, held at Nekoma, recently, all the old officers were re-elected save Directors Robertson of Fairdale, and Momerack of Lankin. J. S. Mc-

Nish, of Fairdale, was elected to fill the former's place, and A. M. Johnson, of Lankin, the latter's.

The Northwestern Telephone Exchange Company has been granted a franchise by the village of Wimbledon to equip and operate an exchange.

The secretary of state has issued a charter to the Northern Rural Telephone Company to operate a telephone system in Tower City, with a capital of $6,000. The incorporators are: Daniel Miller, Horatio Seymour, W. G. Young, Ray C. Clark and Roy F. Smith.

A new rural telephone company was organized at Carrington to construct a phone line to run north and east of Carrington. Work will start at once and the line will be ready for use about August 10. The officers of the new company are: T. N. Putnam, president; A. E. Ireland, secretary and treasurer.

OHIO.

The Marion County Telephone Company has had considerable trouble as the result of the recent storms which have passed over the county. Four hundred telephones were out of commission and four cables were damaged.

The new telephone exchange which is being installed at St. Louisville by the Newark Telephone Company, will be completed in about thirty days.

An action for receivership against the Farmers' Telephone Company of Sidney, was filed July 7, by C. F. Snyder, one of the stockholders, and former secretary. The company is alleged to be insolvent and the action will be heard by Judge Bailey. W. D. Oldham of this city will probably be named as the receiver.

A million dollars will be spent by the Cleveland Telephone Company on improvements this year. Of this $350,000 will enlarge switchboard equipment. Approximately $400,000 will increase underground facilities and improve aerial lines outside the main business district. In telephone buildings, including the new Garfield exchange on E. 105th street, just south of Euclid avenue, now nearing completion, more than $90,000 will be invested.

Work of fixing the physical valuation of the Cleveland Telephone Company has been started by a corps of experts employed by the state public utilities commission. The task is not expected to be completed until December.

OKLAHOMA.

The new building for the Pioneer Telephone Company, on Choctaw street, Sallisaw, has been started and is expected to be completed within forty-five days.

OREGON.

Representing that the business is cared for by the Lebanon line, the Pacific Telephone & Telegraph Company has filed an application with the State Railroad Commission for permission to discontinue its office at Sweet Home.

The Home Telephone Company purchased a lot in Glencoe Park, Mount Tabor, from Robert H. Warfield, for $1,600 for extension purposes.

The Pacific Telephone & Telegraph Company has remodeled and enlarged its Mount Tabor exchange, at the southeast corner of Belmont and East Fifty-fifth street, Portland. The structure has been generally improved at an expense of about $20,000.

The Home Telephone Company is erecting an exchange on East Thirty-ninth street, in the Sunnyside district, at a cost of about $15,000. It is a two-story reinforced concrete structure, and is being built to take care of the Sunnyside and Mount Tabor district. It will be completed in about two months.

Improvements in its service between Portland and Astoria, which will double its present wire facilities, are being made by the Pacific Telephone & Telegraph Company.

The County Commissioners granted the Sauvies Island Telephone Company a right-of-way along the county roads on the island for the construction of a telephone line to bring the farmers of the island into closer communication with each other.

PENNSYLVANIA.

The office force of the Bell Telephone Company of Reading, which has been located temporarily in the News building, has taken possession of its new offices at 31 and 33 North Fifth street, which have been remodeled and refurnished.

Work has been started on installing practically an entirely new P. & A. National telephone system in Taylorstown.

At an adjourned annual meeting of the stockholders of the Pittsburg & Allegheny Telephone Company, which was recently turned bock to the stockholders by the receivers, the following were elected directors: J. L. Dickey, W. C. Handlan, S. W. Harper, Richard Hawkey, Cyrus Huling, F. C. Huling, A. M. Moreland, J. G. Splane, J. S. Weller. The directors elected the following officers: President, Cyrus Huling; vice-president and general manager, Richard Hawkey; treasurer, Frank C. Huling; secretary, Samuel W. Harper. Plans are being completed for extensions and betterments involving a large expenditure.

The Central District Telephone Company directors have approved the expenditure of $312,000 in the construction of the new Grant switchboard to be placed in the building now being erected by the Central District Telephone Company on Seventh avenue, Pittsburg.

After ten years of controversy and litigation the Bell Telephone Company at New Castle, has signed a contract with the city for space in the municipal conduit and will put its lines underground as soon as possible.

SOUTH DAKOTA.

The Dakota Central Telephone Company has purchased the local telephone plant at Iroquois and will make many imprevements, including placing all poles in the alleys.

TEXAS.

The new Dallas County Jail and Criminal Court Building will have both the Bell and Automatic telephones installed as was decided by the County Commissioners' Court, J. C. Casler, president, and Harry L. Seay, a director of the Dallas Automatic Telephone Company.

A large representation of Sabine county people met at the courthouse in Hemphill recently and perfected the organization of the Sabine Citizens' Telephone Company for the purpose of erecting and equipping a standard, up-to-date telephone system to reach every community in the county. The promoters of the company, Butler & Minton, of this place, reported the subscription of the entire capital stock. The capital stock is placed at $5,000, divided into 200 shares. A board of directors and officers were elected, and operations will begin at once and the line completed within the shortest time possible.

Work on the new telephone plant of the Southwestern Telegraph and Telephone Company in Nacogdoches, is nearing completion.

The South Texas Telephone Company has completed its brick building at the corner of Beaumont and Sixth streets, Port Arthur, and the company expects to occupy same about the middle of this month.

The Son Marcos Telephone Company, composed of local stockholders, recently declared a dividend of 5 per cent. This is the first dividend that this company has paid since its reorganization four years ago, all the earnings heretofore having been put into extensions and improvements until the company has built up one of the best local exchanges in the country.

In the Palto Alto settlement, about six miles east of Fredericksburg, a new rural telephone line has been established.

The Navasota Telephone Company is laying an underground cable system.

J. E. Farnsworth of Dallas, vice-president of the Southwestern Telegraph and Telephone Company, states that details of the consolidation of the two telephone systems in Waco, the Brazos Valley is to absorb the Southwestern properties in this city, have been completed. The Brazos Valley Company, under terms of the agreement, will take over the propery of the Southwestern Company, and the latter company will retain its long distance connections, making a working agreement with the purchasing company.

WASHINGTON.

The Lewis county commissioners have granted telephone franchises to the Claquato Rural Telephone Company to operate near Chehalis; and the Evergreen Telephone Company to operate near Centralia.

The Slusser Telephone Company, Blacksburg. C. A. Crumpbacker, president; W. B. Slusser, secretary—both of Blacksburg. Capital, $500 to $2,500.

The Chesapeake and Potomac Telephone company is making extensive improvements in its system in Fredericksburg. A large force of men is engaged on the work and many changes are being made, and the facilities greatly enhanced. When the work is completed, which will not be before January 1, the cost of the improvements will have reached $50,000.

According to an announcement made recently by Division Manager C. H. Weber of the Chesapeake and Potomac Telephone company of Richmond, a new exchange would be built on Stuart avenue near Mulberry street and would be in service about October of the coming year.